THE UNIVERSITY OF ALBERTA

COMMUNICATION PATTERNS IN FORMAL ORGANIZATIONS

by

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A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF EDUCATIONAL ADMINISTRATION

EDMONTON, ALBERTA
FALL, 1973

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "Communication Patterns in Formal Organizations" submitted by William Arthur Adams in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

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ABSTRACT

An investigation of the literature on the classification of communication networks in formal organizations led to the belief that current network descriptors were either too broad and general or too vague and imprecise. A system of classification of communication networks was developed which attempted to avoid these deficiencies. The classification adopted was derived from the fields of botany and geomorphology, and, with extensions, could be sub-divided under three broad headings: those networks which had single upward access, those which had multiple upward access, and those which were horizontal between stations of equal hierarchical status. Classification of organizational communication in terms of this theoretical framework was termed "mesh analysis."

Imaginary communications in a contrived organization were analyzed in terms of three techniques. The conclusion was reached that mesh analysis was more effective as a means of aggregating and analyzing organizational communication patterns than were either sociograms or clique analysis.

Mesh analysis was then carried out on data already available on the communication patterns of a department of The Alberta Teachers' Association. The conclusion was reached that this analysis was effective in providing insights into networks and organization which were not readily obtained by other means, but that data on subject content of messages, and on the "mood" of issuance, would have afforded material assistance.

A means of analyzing communication content in terms of subject matter and in terms of mood of issuance was devised, and the formal written communications of a superintendent in a large Alberta school district were analyzed in these terms, and in terms of networks employed within the system, and of destinations where the communications were directed outside the system. Counts were made of the frequencies of use of the various networks, of the frequencies of mention of various classes of subject content, and in terms of the mood of issuance, whether as instruction, as advice, or as statement of fact, and whether approval was given to, or withheld from, suggested courses of action. These three forms of analysis in combination provided data which served to indicate an administrative communicative "mode" of the superintendent which might be distinctive. Since data were collected on one superordinate figure, no classification or theoretical continuum of communication modes was attempted.

The theories and techniques advanced and demonstrated were judged to be effective in permitting comparisons of communication patterns of persons employed in hierarchically organized structures, or between one organization and another, in a way which might have been difficult, if not impossible, with other means.

Finally, suggestions were made of desirable extensions to communication theory, and a series of propositions advanced, relating network analysis to other facets of personality or organizational circumstances, which might be empirically tested

by principal reference to the classifications and techniques advanced in this study.

ACKNOWLEDGEMENTS

This study owes much to the encouragement afforded by Dr. E. Miklos when the original conceptualization was being developed.

Dr. E. A. Holdaway provided helpful and prompt advice in the development of the final draft.

Dr. G. L. Mowat's allocation of financial assistance over the past two years is gratefully recorded.

The Board of Northland School Division #61 has provided the author with sabbatical leave and with funds which have been essential to the completion of this work.

The staff of the Department of Educational Administration is thanked for providing a scholarly but relaxed atmosphere conducive to reflection over the past two years.

Overwhelmingly, my thanks are owed to the patience of my wife and son, who have supported my pre-occupations with stoic fortitude.

TABLE OF CONTENTS

CHAPTER PAGE

1. INTRODUCTION TO THE STUDY 1
    - INTRODUCTION TO THE PROBLEM 1
    - STATEMENT OF THE PROBLEM 3
    - OUTLINE OF THE REPORT 4
    - SIGNIFICANCE OF THE STUDY 6
    - DELIMITATION OF THE STUDY 9
    - LIMITATION OF THE STUDY 9
2. REVIEW OF THE PERTINENT LITERATURE 11
    - REVIEW OF GENERAL COMMUNICATION LITERATURE . . . 11
        - Mathematical Approaches 12
        - Social Psychological Approaches 15
            - A Model of the Total Communication Process . 16
            - The Co-orientation Model 17
            - Bales and the Interaction Process Analysis Method 19
            - Communication, Power, and Status 20
            - Communication and Status 22
            - Other Distorting Factors in Communication . . 23
        - Linguistic Anthropological Approaches 24
        - Conclusion 28
    - REVIEW OF THE LITERATURE ON COMMUNICATION PATTERNS 29

CHAPTER PAGE

Small Group Networks 29

The Efficiency of Small Groups 31

Leadership and Participation in Small Group Nets 32

Small Group Nets and Organizational Communication 33

Vertical and Horizontal Approaches 34

Directional Communication and Status 34

Directional Approaches and Technology 36

Other Comment on Vertical Approaches 36

Directional Approaches and Organizational Communication 37

Sociograms 38

Sociomatrices 40

Other Literature 43

Conclusions 45

3. THE THEORETICAL FRAMEWORK OF NETWORK CLASSIFICATION 47

DENDRITIC PATTERNS 48

The Basic Dendrite 48

Some Suggested Uses of the Basic Dendrite . . . 50

Variations of the Dendrite 50

Upward Communication Patterns 52

Suggested Uses of the Dendritic Variations . . 53

Conclusion 54

CHAPTER PAGE

RETICULATED PATTERNS 54
  The Basic Reticulation 54
  Some Suggested Uses of the Basic Reticulation . 56
  Variations Within the Reticulation 57
  Some Additional Issues 59
THE HORIZONTAL COMMUNICATION MODEL 60
  The Contoured Communications Map 60
  Uses of Horizontal Communications 65
  Dual Systems of Contoured Communication 66
  Intermittent Contour Changes 68
CONCLUDING REMARKS ON COMMUNICATION PATTERNS . . 70
SUMMARY OF CHAPTER 3 73

4. A COMPARISON OF TECHNIQUES OF ANALYSIS 75
  The Hypothetical "Reality" 76
  Analysis by Sociogram 76
  Clique Analysis of the Hypothetical Data 79
    Three-Step Cliques 80
    Four-Step Cliques 80
  Mesh Analysis Technique Applied to the Hypothetical Data 81
  Conclusions 84

5. APPLICATIONS OF MESH ANALYSIS 86
  Communications in a Teachers' Organization . . . 87
  Summary of Method of Data Collection 87

CHAPTER PAGE

An Alternative Method of Analysis of Data Collected 88

The Analysis of Selected Data 89

Communication Networks Employed by A 95

Communication Networks Employed by B_1 98

Communication Networks Employed by B_2 100

Dendritic Patterns in the Total Communications Department 102

Palmar Patterns in the Total Communications Department 104

Reticulated Patterns in the Communications Department 105

Horizontal Patterns in the Total Communications Department 107

Summary of Total Departmental Patterns 109

Concluding Remarks on Mesh Analysis Technique . . 111

6. COMMUNICATIONS OF A SUPERORDINATE 114

Description of the Educational System 114

Data Collection 118

Message Analysis and Coding 119

Message Content Coding 120

Single and Multiple Coding 128

Definition of a Communication 128

Assumptions 129

Delimitations 129

Limitations 129

CHAPTER PAGE

Realiability of the Coding Classifications 130

Examples of Communication Content Coding 133

Comment on Coding Examples 136

Analytical Techniques 138

The Analysis of the Bulletins 139

The Analysis of Communication - Letters and Memoranda 142

Summary and Implications of the Investigation . . . 155

7. SUMMARY, IMPLICATIONS, EXTENSIONS, AND PROPOSITIONS . 159

SUMMARY, IMPLICATIONS, AND EXTENSIONS 159

Extension of Communication Theory 164

PROPOSITIONS RELATED TO NETWORK ANALYSIS 167

Proposition 1 167

Proposition 2 169

Proposition 3 170

Proposition 4 172

Proposition 5 174

Proposition 6 175

Proposition 7 175

Proposition 8 177

Proposition 9 177

Proposition 10 178

Concluding Remarks on the Proposition 179

BIBLIOGRAPHY 181

LIST OF TABLES

TABLE		PAGE
1	Networks of Communications Transmitted by Stations	93
2	Comparisons of Three Codings of the Sample	134
3	Number of Communications Coded by Subject and Month	140
4	Analysis of Communication Mood and Content	146
5	Analysis of Internal Mood and Content	153

LIST OF FIGURES

FIGURE		PAGE
1	The Broadcast Model	12
2	The Cybernetic Communications Model	14
3	The Westley and MacLean Model	16
4	The Co-orientation Model	17
5	The Cultural Model of Interaction	22
6	Typical Small-Group Networks	30
7	A Contrived Sociogram	39
8	A Contrived Sociomatrix	41
9	The Basic Dendrite	49
10	The Contracted Dendrite	51
11	A Partial Palmar Fan	52
12	The Basic Reticulation	55
13	A Partial Reticulation	57
14	A Partial Contracted Reticulation	58
15	Horizontal Communication Patterns	61
16	The All-channel Network	62
17	The Contoured Communication Map	63
18	A Polar Co-ordinate Table of Organization	64
19	A Sociogram of Postulated Data	78
20	Superimposed Communication Networks	83
21	The Table of Organization	89
22	The Consolidated Communications Matrix	91

FIGURE PAGE

23 Communication Networks Employed by A 96

24 Communication Networks Employed by B_1 98

25 Communication Networks Employed by B_2 100

26 Downward Dendritic Networks 102

27 Upward Dendritic Networks 103

28 Downward Palmar Networks 104

29 Upward Palmar Networks 105

30 Downward Reticulated Networks 106

31 Upward Reticulated Networks 107

32 Horizontal Communication Within and Among Groups . 108

33 The Table of Organization, Central Office 116

34 Communications Received Within the System 149

CHAPTER 1

INTRODUCTION TO THE STUDY

While the literature on communication studies is plentiful, there is a dearth of material which bears on the issue of communication patterns except in the context of small experimental groups in which the pattern of communication is frequently one of the variables under examination and manipulated in the course of the investigation. In field studies of communications of functioning organizations, descriptors of patterns or networks only exist in broad and general terms such as "horizontal" or "vertical," "formal" and "informal," "official" and "unofficial." These terms are not descriptive of configurations, but of directions and definitions of modes of address. The issue of typologies of communication patterns in other than small experimental groups appears to have been neglected as a field of investigation. A classification or typology of communication patterns in formal organizations was considered to be both practicable and desirable.

INTRODUCTION TO THE PROBLEM

Formal organizations almost invariably comprise a hierarchical structure in which superordinates control, direct, or co-ordinate the activities of subordinates through the medium of communication. These communications may be transmitted orally, through face-to-face meetings, by telephone or radio; they may be written; they may be wordless, as when a facial expression conveys approval, disagreement, or indifference. As stated by Katz and Kahn (1965:223), "Most of our actions toward others and their actions toward us are communicative acts, whether or not they reach verbal expression." In formal organizations, communication is possible between any person and any other; hence the number of potential contacts in a large organization is very large. For example, in an organization with so few members as one hundred, each person of that hundred has the theoretical option of communication with the remaining ninety-nine, so that the organization has the capacity of nine thousand and nine hundred one-way communication transmissions.

Formal organizations tend to restrict and institutionalize channels of communication in the interest of efficiency and economy of effort. The chief executive will rarely encourage direct communication to himself concerning matters that might be dealt with effectively by people in lower echelons. Policies and routines prescribe that communications on certain matters be channelled to persons who have expertise or responsibility to deal with these issues. The patterns of communication that emerge in organizations might be expected to vary according to the personal preferences, the communicative "modes" of the originator; according to the organizational task, for an espionage system would hardly use the same methods and channels as a sales force. The structure of the organization might influence the communication patterns, for those which might prevail in a highly centralized organization might be inappropriate in another which might be composed of dispersed and semi-autonomous sub-systems.

STATEMENT OF THE PROBLEM

The central research problem was to devise a comprehensive classification of the communication networks which may be used in formal organizations.

The subordinate research problems were:

1. To analyze communication networks by three techniques to demonstrate that the classification system advanced in this study leads to insights which are not afforded by other means.

2. To demonstrate such insights by the examination of data gathered by sociometric-type questions from the personnel of a functioning organization.

3. To devise a method of analyzing the content of communications in terms of subject matter and mood of issuance in addition to analysis of network choice in order to establish a basis for describing the administrative communication style of an individual in a formal organization.

4. To examine the communications of an individual in a formal organization in terms of network choice, frequency of network usage, subject matter content, and mood of issuance, in order to

obtain insights into administrative communication choice which were not readily available by other means.

5. To develop propositions which meaningfully relate the analysis of communication patterns to other facets of individual personality or other organizational circumstances which may be empirically tested by principal reference to the network typology developed in this study.

OUTLINE OF THE REPORT

Chapter 2 reports a review of the literature on communication under two headings; (1) literature which is related to communication theory in general, and (2) literature which has specific reference to communication networks *per se*. The conclusion was drawn from this survey that extant discriptors of communication networks were either too general or too imprecise to serve as a basis for a useful classification of communication patterns.

Chapter 3 developed a system of classification of communication patterns derived from the fields of geomorphology and botany. In brief, the observed parallel between river drainage systems or leaf venation systems, considered as patterns of collection and distribution, and communication patterns performing the same function for information was developed. Three broad groupings of communication networks were distinguished: (1) those which had single upward access from subordinate to superordinate, (2) those which had multiple upward access from subordinate to superordinate, and (3) those which were essentially between stations of equal hierarchical status. Each of these main groups was further developed and differentiated, and variant forms discussed.

In Chapter 4 the utility of this system of classification was tested in theory. An imaginary table of organization was drawn up and a short series of plausible messages between stations of this contrived organization was written to provide raw data for analysis by three different techniques. Data were aggregated and analyzed by means of a sociogram, by clique analysis, and in terms of the classifications advanced in this study, which, as a technique, was termed "mesh analysis." The results tended to demonstrate that mesh analysis was particularly applicable to the examination of communications in formal organizations, in that while some data are inevitably lost by aggregation of data, this loss was less by this means than by use of the sociogram or clique analysis. The latter two techniques, while admittedly not devised for the analysis or aggregation of communication data from formal organizations, tended to lead to conclusions which might be misleading.

In Chapter 5, mesh analysis was again tested with reference to data collected in another context by sociometric-type questions. That type of analysis which had been employed in the analysis of contrived data in an imaginary organization was thus employed in a real situation. Inferences and insights into the organization under study were obtained which could not have been obtained without principal reference to the theoretical classification of communication patterns advanced in this study. However, the conclusion was reached that network choice and frequence of usage of networks alone without knowledge of content and mood of issuance of messages, hampered the development of insights and inferences into personal styles of communications.

Chapter 6, provides a description of all the written communications of a superordinate figure in a large urban school district which were collected over a period of one year. These communications were analyzed in terms of network choice, frequency of network usage, subject matter content, and mood of issuance. As a result of these analyses the elements of a distinctive communicative mode of the superordinate could be distinguished. Since only one superordinate's communications were examined, no classification of communicative styles was attempted.

In Chapter 7 various propositions were advanced which might be tested empirically, and which related communication networks to other conditions or circumstances or formal organizations. Suggestions were also made concerning desirable and practicable extensions of research into communication theory.

SIGNIFICANCE OF THE STUDY

There is much evidence in the literature to the effect that communication is an essential element of the administrative process. Dorsey (1957:310) states:

> If administration is defined as a process consisting elementally of decisions and if decisions are essentially communication phenomena, it follows that administration can be viewed as a communication process.

Barnard (1938:423) reinforces this viewpoint in stating:

> This system of communication, or its maintenance, is a primary or essential continuing problem of a formal organization. Every other practical question of effectiveness or efficiency -- that is, of the factors of survival -- depends on it.

There is also a considerable body of opinion that communication is not well understood in the field, nor adequately examined in research. March and Simon (1956:82) note that "communication is one of the least understood areas in administration . . . ." Applewhite (1965:106) comments that the small group laboratory approach ". . . like the communication net studies, has, as yet, contributed little absolute knowledge about behavior under realistic communication situations." This is reinforced by Guetzkow (1965:535) who observes that:

> The richness of materials at the individual and group level has induced extrapolation of findings perhaps inappropriate for rigorous analysis of communications in organizations. Yet, with the dearth of studies whether from the field or laboratory, one can but join with others in speculation.

Etzioni (1961:137) comments that "There are very few functional-structural studies of communications in organization."

Concerning communication networks or patterns, the literature nowhere describes configurations in other than small groups, but with reference to the communication flow in organizations, Thayer (1961:251) notes that:

> Not many administrators, it would seem, understand or use channels as tools of their communication. This is true basically, we may suspect, because very little has been known or even studied about communication channels, their uses, their relative advantages, and so on.

Katz and Kahn (1966:247) with reference to a classification of channels into those which direct communication horizontally, upward, or downward, state that:

> There are no studies of the distinctive types of communication which characteristically flow horizontally, upward, or downward in organizations, although such research is much needed.

The literature quoted demonstrates that the study of administrative communication still leaves much which is yet obscure. The field of communication channels has as yet attracted little attention from researchers, and is one which is not founded on a commonly accepted conceptual basis. This study attempts to develop such a base and to provide a means by which communication channels might be described with precision so that empirical investigation of communications in organizations might be facilitated.

If a classification of communication patterns can be successfully completed, comparisons between individuals and organizations might be undertaken relating to the usage of the various defined channels and relating these to considerations of personality, functions, and structures in a manner which has hitherto been difficult, if not impossible.

DELIMITATION OF THE STUDY

The delimitations discussed in this chapter refer only to the conceptual theory. Separate delimitations were established in the cases of empirical investigations based on such conceptualizations.

The conceptual theory of the classification of communication networks is confined to formal organizations which have a hierarchical structure and a defined chain of command or responsibility, whereby each superordinate directs or co-ordinates the activities of a number of subordinates. "Communication" as a definition of an activity excludes those communicative acts which are non-verbal, such as gestures or facial expressions. The definition also excludes those verbal expressions which are non-deliberate, as when a message is mis-directed or a telephone conversation is overheard accidentally.

LIMITATIONS OF THE STUDY

Only formal, work-oriented communications were considered in the study, though "formal" was defined for theoretical purposes as inclusive of all deliberate verbal acts, whether they were or were not confined to a declared or recognized chain of command. Although the "tone" of a communication was accepted as being of importance in eliciting favorable or unfavorable responses in the recipients, such sources of behavioral "noise" were ignored, for data on such noise, related to written and verbal communications, could not be reliably gathered, and such data have little obvious bearing on issues of channel classification and selection.

CHAPTER 2

REVIEW OF THE PERTINENT LITERATURE

The literature on communication theory is voluminous, and for that reason it has been considered in two sections: that which is concerned with general aspects of communication theory, and that which deals directly with communication patterns *per se*.

REVIEW OF GENERAL COMMUNICATION LITERATURE

While the prime focus of this study is concerned with aspects of communication networks, there exist important areas of communication research which lie outside this particular field, and which are yet essential to any thorough discussion of communications. For example, network analysis alone is incomplete without an examination of what messages are transmitted by various channels. Any channel might carry orders, suggestions, and requests from one station to another, and these "moods" of issuance of communications may be important in investigating individual or organizational communicative "modes."

The general field is both immense and amorphous, but may be conveniently divided into three areas: the investigations of the mathematicians, of the social-psychologists, and of linguistic anthropologists.

Mathematical Approaches

Mathematical viewpoints of communication have recently stemmed from the work of telecommunication engineers and from the study of modern automation. Weaver (1966:17) reporting the work of Shannon at the Bell Telephone laboratories, gives a model of a communication system, which might be termed the "Broadcast Model."

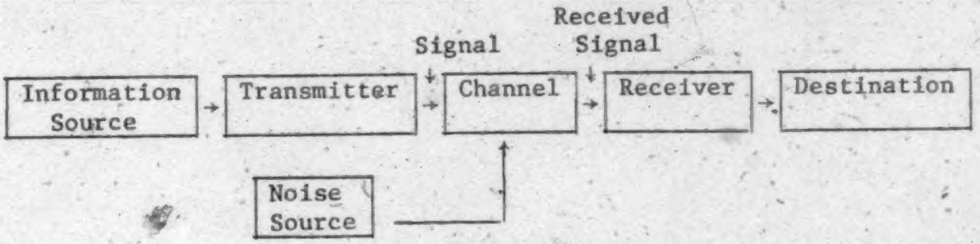


Figure 1

The Broadcast Model

This is interpreted as follows: The information source (or sender) selects one message from the set of possible messages, changes the message into a signal (written, oral, mechanical, etc.) via a channel or channels (face-to-face, telephone, or letter) to receiver, who reconverts the received signal to a message (e.g. the signal may be received by eye or ear, and is changed to a message by the brain). However the original message may not be identical with the received message due to mechanical (static, distortion, error in transmission, fading) and semantic (misunderstanding, inadequacy of vocabulary) noise. If communication is considered to be a verbal process, it must be accepted that the process of thought cannot be exactly rendered into speech (McLuhan, 1964:24). The Shannon-Weaver model is extant in various modifications and extensions, as by Defleur and Larsen (1958:8), by Berlo (1960:32), and by Bassett (1968:107). Sources of misunderstanding (noise) in the model include, according to Merrihue (1960:18-20) the functional relationship between the sender and the receiver, the positional relationship, the group-member relationship, differences in heredity and environment, differences in formal education, past experience, emotional states, and misunderstanding of words. In the latter connection Erickson and Pedersen (1966:2-3) note that the leader's ability to transmit and receive verbal and non-verbal signals correctly is "particularly relevant to coding discrepancies." Weaver (1966:20) declares that the "grand central theorem" of this communication theory is:

> Suppose that a noisy channel of capacity C is accepting information from a source of entropy H, entropy corresponding to the number of possible messages from the source. If the channel capacity C is equal to or larger than H, then by devising appropriate coding systems the output of the source can be transmitted over the channel with as little error as one pleases. But if the channel capacity C is less than H, the entropy of the source, then it is impossible to devise codes which reduce the error frequency as low as one may please.

An additional mathematical model is derived from cybernation. The basic term is derived from the Greek word for "governor" and in a simple form has been likened to the well-known governor on the steam engine, which operates by centrifugal force to control power input. The basic diagram of the cybernetic approach is illustrated below.

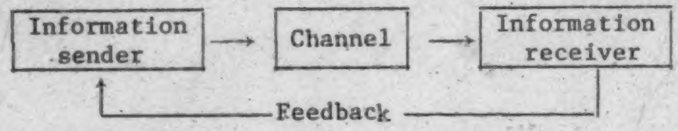


Figure 2

The Cybernetic Communication Model

The essential difference between this and the previous model is that the cybernetic model is seen as a cyclic system. There is a reaction to a transmission which can furnish feedback to the transmitter concerning such matters as acknowledgement of receipt, adequacy of communication, or appropriateness of the communication to perceived circumstances. The Shannon-Weaver model is more appropriate to represent a one-way broadcast. There are models which combine the features of the "broadcast" and cybernetic" models. Such a model is provided by Bassett (1968:107), but it is not reproduced here, since its essential features are derived from those models already figured.

Various other models of a mathematical nature have been developed to describe or approximate conditions in communication. Many of these are highly technical and apply only to electronic communications. One such is displayed by Lane, Corwin, and Monahan (1967:72). They state, "DeFleur proposes:

$$\Delta\rho = \frac{\chi\Delta r}{r} \text{ ; and } H = -K \sum_{i=1}^{n} Pt \log Pi$$

and comment:

> Concerning the latter formula, he explains that H (the information source) is a "monotony increasing function of n, and K is a positive constant." Beyond general recognition that such models exist, and acknowledgement of their technical complexity, further consideration of them is beyond the scope of this book."

This comment will serve here also.

An interesting application of mathematics to information theory is advanced by Rapoport (1966:41-55). He points out that the "interesting part of information theory deals with determining the amount of information in a message in terms of its source, not merely in terms of its length (it isn't what you say: it's what you could say)." He explains the concept of redundancy by stating that it may be taken "as a measure of the fraction of the letters which can be randomly deleted from a reasonably long message without making the message unintelligible. FR EXMPLE WENTYIVE PRCET OF HE LTTERS I TIS SENTENCE HVEBEN DLETED AT RANM. The redundancy of English is said to be over 50 percent (Rapoport, 1966:51)."

Social Psychological Approaches

The central thrust of the social psychological approach is the observation of people interacting in groups. In these groups certain members transmit information, both voluntarily and involuntarily, by means of a code and through certain channels to other members who then decode the message as received and perceived. There are both social and psychological implications.

A model of the total communication process. Westley and MacLean (1966:83) have provided what they consider to be "a conceptual model of the total communication process," as figured below:

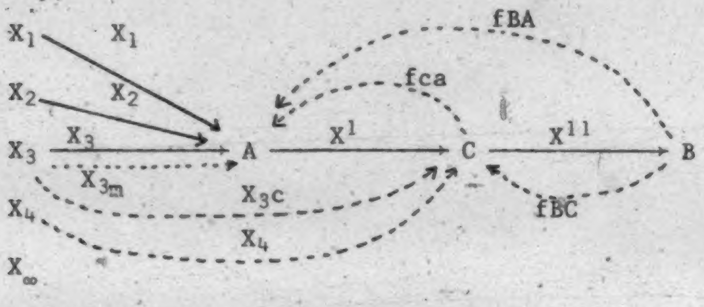


Figure 3

The Westley and MacLean Model

This appears to be an extension of the Newcomb model, which will be discussed below, and to the effect that A transmits something to B and an X. In the above model, C is an "encoder" among several such C's, whose role is to select the abstractions of object X from all the X's appropriate to the needs of B. He then transforms them into symbols whose meanings B shares to some extent with C, and transmits them by a channel to B. B will tend to return to those C's which provide him with recurring satisfaction. Additionally B receives messages from A's, who also select from the environment of X's. Some of these messages are sent by more than one channel, as indicated by the dotted line X_{3m}. Feedback moves from B to C, from B to A, and from C to A. The authors differentiate between "purposive" and "non-purposive" messages, stating that "When a person says something that he hopes will reach another's ears, he is an A, but if he says it without such intent and it nevertheless is transmitted to B, his act must be conceived of as an X, the selection and transmission having been performed by a C." The model appears to accommodate the "two-step theory of communication flow" postulated by Katz (1957:61-78) which hypothesizes that influences stemming from the mass media first influence the opinion leaders in the community or society, who then pass on their opinions to those associates by whom the leaders are held in regard.

The Co-orientation model. Newcomb (1966:66-79) introduced the concept of "co-orientation," illustrated below.

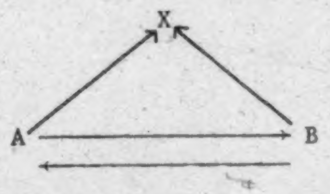


Figure 4

The Co-orientation Model

They consider that when an A transmits information to a B about an X, both have orientations concerning each other and also with reference to the X. The minimal components of the model are A's orientation toward X as an object to be approached or avoided, together with his cognitive attitudes toward X, A's orientation toward B in exactly the same sense, B's orientation toward A, and B's orientation toward X. Each of these components is subject to change. They argue that:

> To the extent that A's orientation toward X is contingent on B's orientation toward X, A's orientation will be facilitated by similarity of his own and B's orientation toward X. The first advantage of symmetry -- particularly of cognitive symmetry -- is that of ready calculability of the other's behavior; the more similar A's and B's cognitive orientations, the less necessity for either of them to "translate" X in terms of the other's orientations, the less the likelihood of failure or error in such "translations," and thus the less different and/or the less erroneous the co-orientation of the other.

They strongly suggest that interpersonal attraction varies with the degree to which the demands of co-orientation are met by communicative acts; a view which is elsewhere supported. Guetzkow (1965:554) quotes Campbell (1958) to the effect that "the transmitter's output may be expected to deviate from input in the direction of pleasing the recipient, avoiding distress etc." He also notes (1965:556) that Triandis (1959) found that "boss-subordinate pairs could communicate more effectively when they similarly categorized particular people (such as the personnel director of the company and the vice-president of their division) . . . ." Homans (1950:135) states that "persons who interact with each other frequently are more like each other in their activities than they are like other people with whom they interact less frequently." Bales (1966:101) writes that "Apparently reactions that are emotionally gratifying to other members tend to be generalized by them into liking for the person who expresses the reactions."

Bales and the Interaction Process Analysis Method. Bales (1966:94-102) has developed a method of analysing group interaction which he names "Interaction Process Analysis," whereby much, if not all, group activity is considered to be directed toward problem-solving (Olmstead, 1959:117). Bales has classified group interaction as being of twelve types, grouped into four broad areas, these last being Social-emotional with both positive and negative aspects ("shows solidarity" versus "shows antagonism"); and Task-orientated activities sub-divided between offering opinions and soliciting them. In experimental situations, groups have their activities tape-recorded and they are usually observed by trained recorders who may be concealed behind one-way mirrors. Bales notes (1966:100-102) that progress toward a decision is characterized by different frequencies of the categorized interactions at different points in the meeting. Information giving decreases throughout the session, while suggestions and positive and negative reactions increase. He notes also that those persons who are agreed afterward by the group to have had the best ideas are usually those who did the most talking and had higher than average rates of giving suggestion and opinion. He states that role differentiation may occur in the group; the man who advances ideas may not be the same man as the one who best preserves harmony by laughing and smiling or by otherwise indicating agreement. He points out the importance of group consensus on major cultural norms, stating that if such is lacking, "the interaction process becomes primarily a means for the expression of individual emotional states."

Commenting on Bales' observations and conceptualizations, and those based on the sociometric approach, Olmstead (1959:131) observes that while the latter approach holds that popularity is equivalent to leadership whereas Bales found that the "leader" role coincided with "liking" in only 14 percent of the cases. Several other techniques for analysing communication in various circumstances exist, but comment on these is omitted at this point.

Communication, power, and status. Mulder (1966:259-274) concerns himself with the issue of social power as a variable in the communication process rather than with the degree of centrality or with the topological structure of the group communication network. His fundamental hypothesis is that "the exercise of power is a primary determinant of satisfaction in a number of communication experiments and in general." (Mulder, 1966:260) He postulates that members will tend to reduce the distance between themselves and the more powerful members of the group, and to increase the distance between themselves and more powerful members. Having defined self-realization as "having the responsibility for the completion of one's own task," he also hypothesized that "To the extent that a person's self-realization is greater, his satisfaction will also increase." He concluded, with some reservations on his methodology, that the exercise of power (determining the behavior of another person) did lead to satisfaction; that there did appear to be a tendency toward diminishing the distance between oneself and the more powerful, provided that the initial distance was not too great, and to increase the distance between oneself and the less powerful provided that the initial distance was not too small; and that self-realization in the sense of completing one's own task did not increase, nor lead to satisfaction. In a later paper (Mulder:1970) he observes: "with regard to power, a certain ambivalence manifests itself in social research and daily experience: although people may find it acceptable to be together with the more powerful in certain conditions, a general trend is to prefer not to be dependent on others." It is not clear, in the above research, how the less powerful might prefer to associate themselves with the more powerful if at the same time the more powerful do not desire such association. The two tendencies postulated by Mulder seem to be mutually contradictory. Again, the reference to "too great" or "too small" an "initial distance," are not sufficiently precise to serve as a guide to conduct or experiment.

The possibility that ingratiating behavior by a subordinate toward a superordinate approximates to the appeasement gestures of wolves, dogs, fish, and baboons is hinted at by Lorenz (1963:131-137) but does not appear to have been explored in administrative literature.

Communication and status. Bennett and McKnight afford an interesting insight into the issue of status as it affects cultural interaction.

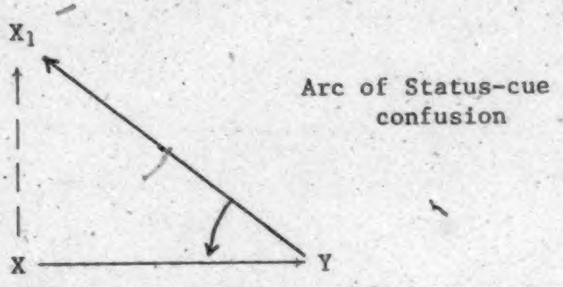


Figure 5

The Cultural Model of Interaction

Bennett and McKnight (1966:606-608) explain their models in these general terms: when a person from a society which values and emphasizes hierarchical tendencies meets a person from a society with egalitarian tendencies, X, the egalitarian, sees Y as an equal; whereas Y, conceiving X as a superior in position X_1, considers that X is not behaving as he should, and hence is unable to react accurately. The authors note that the "average Japanese" perceived "average Americans" as superior persons who should be approached with distant respect and withdrawal, and they claim that this goes far to explain the "typical" behavior of the shy and embarrassed Japanese on the American campus.

The same sort of process may be at work in the organizational setting, where, with the best of intentions on either side, management and its subordinates may be unable to communicate accurately and effectively. Stouffer (1952:265-272) points out that in the United States Armed Forces, the officers failed to appreciate the basic problems of their subordinates, even when the problems had been expressed. Gardner (1946:46) found the same problem in an industrial setting. Foremen were considered by top management to be company-oriented and well "in the picture," while foremen considered themselves to be regarded as mere functionaries by management. Gardner states that "[These feelings of resentment] arise essentially from the lack of communication between status levels."

Burns (1954:73-97) reports a field study carried out in the production department of a British firm, where although the departmental manager recorded himself as giving instructions or decisions in 165 of 237 episodes, his subordinates only recorded receiving communications in these two categories on 84 occasions. His instructions and decisions were apparently being treated as information or advice. This tends to support Mulder's observation (1970) that the general trend is for people to prefer not to be dependent on others, referred to above,

Other distorting factors in communication. If hierarchical and social status have a distorting effect on communication, then other factors which distinguish one group from another may be assumed to have potential as barriers to effective communication. Lane, Corwin, and Monahan (1967:83-91) list local-cosmopolitan orientation, age, sex, and social class as such barriers. Hall and White (1966:567-576) note that time has a different significance in Latin America than is the case in the U.S.A.; that in Central America a salesman is expected to call at least three times on a customer before attempting a sale, in contrast to the North American tradition of immediate business; that in India, one never discusses business when visiting a man's home; that in America, the "proper" distance at which to stand when conversing with another adult male is about two feet, while to a Latin-American male such a distance implies a cold and distant demeanor; and that the American tradition encourages that differences are thrashed out in a face-to-face contact, while the Latin-American tradition tends to solve such situations by enlisting the aid of a third party. In the Shannon and Weaver model, these impediments to communication would be considered to be "noise," both semantic and cultural.

Linguistic Anthropological Approaches

It is not our purpose, even if it were in our power, to conduct a thorough review of linguistics in anthropology, but to sketch an outline of the relationships between linguistic anthropology and communication. Beginning with the writings and under the leadership of Frank Boas (1911) interest was aroused in the relationships between the two fields of language and culture, and in the connections between language, behavior, and thought. Sapir (1931) suggested that a thorough examination of linguistic structure might be essential to the understanding of the wide differences exhibited among people of different cultures, and to the perceptive and cognitive structures of human beings. Linguistic anthropology thus became "concerned not only with the scientific study of language, but also with language as an important influence in the molding of cultures and in the orientation of human thinking," (Hoijer, 1970:45). A pupil of Sapir, Benjamin Whorf, hypothesized that the patterns of a language may relate to other cultural patterns: that culture may shape language and *vice versa*. Commenting on the Whorfian hypothesis, Fishman (1966:505-516) discusses the issue of codifiability -- the "lexical store" of words which distinguish between nuances of an object -- by noting that the Aztec have only one word for "cold," "ice," and "snow;" that the Hopi distinguish between moving and stationary water; that the Eskimo has scores of words for differing snow conditions as the Arab has for horses. Noting that Whorf had pointed out that the Hopi have no verb tense forms and class events by duration categories, Fishman (1966:510-511) adds that:

> To Whorf all these grammatical features seemed congruent with an outlook on life that was "timeless" and ahistorical in the sense that past, present, and future were seen as a continuity of duration, experience being cumulative and unchanging for countless generations.

and further, with reference to Hoijer's investigation of the Navaho that "Hoijer interprets these grammatical characteristics as being consistent with the "passivity" and "fatefulness" of Navaho life and mythology in which individuals adjust to a universe that is given."

In the same vein, Khin Maung Win (1964:223-236) states that Burmese is practically a tenseless language whose main function is to relate events regardless of the time when they took place, will take place, or are taking place. He infers from this and other data that the Burmese people live in a context of immediately experienced present events and that therefore Burmese are not generally happy if pressed to make precise appointments with other people. It would appear then that the language-culture bond of the Whorfian hypothesis has some support derived from what appear to be reasonable inference by investigations.

While it has been postulated that different cultures mold and are molded by language, the same appears to hold true for social structures within a society. Bernstein (1966:427-441) argues that:

> Language . . . represents the totality of options and the attendant rules for doing things with words. It symbolizes what can be done. Speech, on the other hand, is constrained by the circumstances of the moment, by the dictate of a local social relation and so symbolizes not what can be done, but what is done.

This is congruent with common experience; one does not speak to a child in the same words as one uses to an adult, nor to an educated person in the same terms as one would address an uneducated person. The effect of social origin and upbringing is summarized by Bernstein (1966:441):

> The relative backwardness (of working class children as compared with middle class children in verbal I.Q.) may well be a form of culturally induced backwardness transmitted to the child through the linguistic process. The code the child brings to school symbolizes his social identity. The code orients the child to a pattern of relationships which constitute for the child his psychological reality and this reality is reinforced every time he speaks.

The effectiveness of communication (as measured by the rate of opinion change) was tested by both Sencer (1965) and by Bettinghaus (1959). Sencer found that when written messages containing identical information but with different numbers of grammatical errors were presented to a number of subjects, opinion change was least when the number of errors was greatest; the readers appeared to resent having to read error-laden messages, even when they were perfectly understandable. Bettinghaus found the same results when identical messages were delivered orally, but the speaker made deliberately "good" and "poor" presentations. These investigations tend to demonstrate that the effectiveness of communication is to some degree independent of the actual content, in that opinion change is influenced strongly by the mode of presentation. This is again congruent with common experience. The phrases "talking over one's head" and "talking down to people" indicate that there is a mode of presentation which is appropriate to the expectation of a particular audience.

It is interesting to note that some languages appear to avoid such social contretemps by the grammatical modification of syntax by particular persons of known status. Thus Tatsuro Yamamoto (1964:98) gives a list of some eleven variations of a single verb form in Japanese: the single sentence illustrated varied according to the social status of the speaker. Modifications of language according to the status of the listener are also common; for example, the differentiation "tu" and "vous" in French, and between "ap" and "tum" in Urdu. Both pairs of words are singular and plural forms of the second person pronoun, and are used in particular social circumstances.

Conclusion

This concludes the examination of the literature concerning those aspects of communication which are not related to communication networks or patterns. The emphasis in this section has been on the pragmatics of communication (how signs are related to people), rather than on syntactics (how signs relate to each other) or semantics (how signs relate to things). This restriction has been partly due to restrictions on time and space, and partly because the latter two aspects of communication tend to be outside the bounds of what is designed as an administrative, rather than a linguistic, study. An indication has been given of the extreme diversity, complexity, and cross-disciplinary nature of the literature of communications, which will serve as a background to further discussions of networks, content and mood analysis, and of propositions which relate networks to other facets of organizational structure and individual personality.

REVIEW OF THE LITERATURE ON COMMUNICATION PATTERNS

The literature which deals with communication patterns is considered under five headings, as follows:

1. Small group networks
2. Vertical and horizontal approaches
3. Sociograms
4. Socio-matrices
5. Other literature

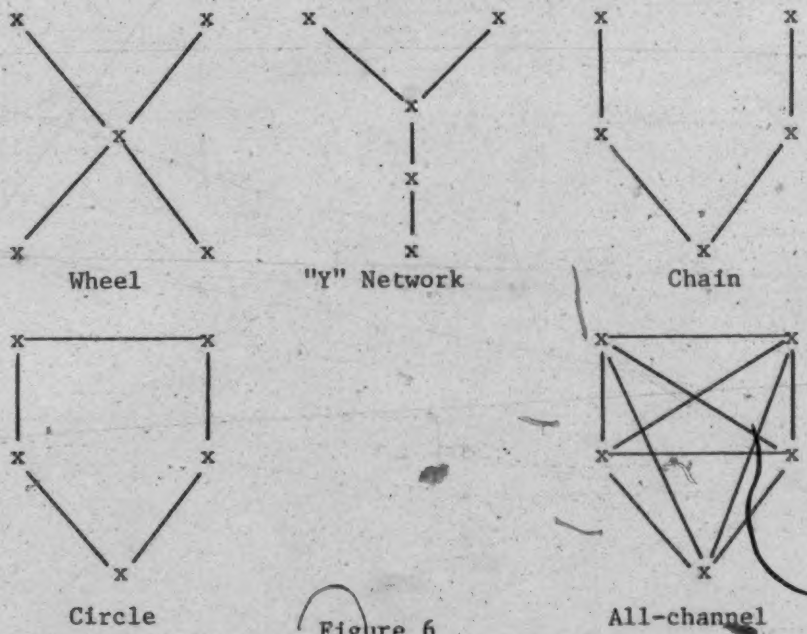
Small Group Networks

In general, the analysis of small group networks had centered on behavioral aspects of the interaction of persons assigned to various stations of a pre-determined and artificial configuration under laboratory conditions. Typically the researchers have taken groups of three (Heise and Miller:1966), four (Shaw, Rothschild, and Strickland:1966), or five (Bavelas:1953; Leavitt:1951) stations, and arranged that only certain communication paths have been available to the experimental group. Bavelas, a pioneer of small group communication, posed the following questions to himself (Bavelas, 1953:493-494):

> Do certain patterns have structural properties which may limit group performance? May it be that among certain communication patterns -- all logically adequate for the successful completion of a specified task -- one will result in significantly better performance than another?

In his experiment, Bavelas separated his subjects by partitions and had them solve problems by passing notes through slots or by pressing keys which caused lights to blink in other booths. The results could be analysed by considering the number and nature of the messages sent, and correlated with such variables as the complexity of the problem, the efficiency of the solutions, subject estimates of group leadership, and the amount of job satisfaction associated with each experimental network.

Some of the networks associated with this approach are illustrated below.



Wheel

"Y" Network

Chain

Circle

All-channel

Figure 6

Typical Small-Group Networks

Bavelas used the wheel, the "Y" network, the chain, and the circle; Leavitt (1951:39) the All-Channel network, the chain, and the star (or wheel); Macy, Christie, and Luce (1966:287) the circle, wheel and star, while re-classifying the All-Channel network as the "star."

Taylor, Berry, and Block (1963:455-457), commenting on the work of Bavelas, state that while these networks "were not intended to be literal imitations of organizational channels, nevertheless they do come very close to describing channels that as a matter of fact, are used in business organizations." However, the general argument which follows their examination of the efficiency of various networks only refers to an arbitrary division of patterns into those which they refer to as "highly centralized" and those which are "low in centralization."

The efficiency of small groups. Much similar research was stimulated by Bavelas. In summarizing the results of these investigations, Taylor, Berry, and Block (1963:457) indicate that those networks which are highly centralized facilitate efficient performance of routine problem-solving involving the assembly of information. They strengthen the leadership position of the member having access to the greatest number of channels and hence to most information, and quickly stabilize the interactions among members. Those networks which are low in centralization produce higher levels of satisfaction among participating members, facilitate the handling of ambiguous and unpredictable situations, and are likely to be more responsive to innovative solutions.

Further work by Guetzkow and Dill (1957) and Carzo (1963) has cast doubt on the proposition that highly centralized networks are more efficient in finding solutions than those which are lower in centralization, provided that the group is allowed to organize itself to deal with the specific nature of the task. As stated by Guetzkow (1965:566):

> Given the ingenuity of the members in most organizations, it may well be that the limitations imposed by many communication nets are eventually surmountable for a large variety of tasks, if there is sufficient motivation.

Leadership and participation in small group nets. Concerning the researches of Maier and Solem (1952), Blau (1962) notes that small groups, with and without formal discussion leaders, performed with varying efficiency in mathematical problem solving. The groups without leaders proved inferior to those which had a leader. The explanation offered was that groups without leaders tended to form cliques of majority opinion which exerted pressures to suppress minority opinions, whereas those groups which had appointed discussion leaders ensured that all members had the opportunity to express their views, and hence tended to assist in the search for the correct solution. Blau (1962:243) further comments that:

> Studies of experimental and work groups have shown that status differences restrict the participation of low-status members, channel a disproportional amount of communication to the high-status members, discourage criticism of the suggestions of the highs, encourage rejecting the suggestions of the lows, and reduce the work satisfaction of the lows and their motivation to make contributions.

Small group nets and organizational communication. The research into small group networks has been based on experimentally created situations and groupings, and largely involves artifically contrived tasks, such as requiring the group to find which symbol is held in common by each of a five man group, when each possesses five different symbols (Guetzkow and Simon:1955) or reproducing patterns of rectangles (Kelley:1951). Such tasks, engaging such groups, can have but little relevance to communications in functioning organizations, where the task varies according to circumstances, and the channels of communication and the number of participators vary continually. It is certainly possible to locate wheels, chains, "Y" networks and the like in organizations, but the incumbents of the several stations may have a hierarchical status which is not assumed in the configurations of the small group networks; and again such configurations may not persist over time unless artifical restrictions on communication are introduced. The conclusion is therefore made that the networks typically employed in small group research are unlikely to be of much value in developing a theoretical classification of communication patterns in formal organizations.

Vertical and Horizontal Approaches

Studies which involve the differentiation of communications into those which flow horizontally and vertically comprise both experimental groups and those from the field. The approach is based on the acceptance of a hierarchical structure of subordinates, equals, and superordinates. The division of communications into these components assumes the existence of a network, but does not lend itself to a classification of channels except in the gross dimensions of direction based on status.

Directional communication and status.

Kelley (1951:39-56) set up experimental groups of eight persons who could only communicate in writing concerning the placement of bricks in patterns. Status was manipulated by informing certain members that their tasks were both menial and trivial, while others were told that their tasks required insight, comprehension, accuracy, and even creativity. Each group of eight was sub-divided into two groups of four, whose status was thus differentiated. In fact, all messages between groups were intercepted and certain other messages substituted containing instructions for placing the bricks and other irrelevant matter not related to the task. The results were summarized as follows:

1. The more unpleasant the hierarchical position, the more the incumbents tended to transmit task irrelevant content to other levels.

2. Low status persons who wished to be re-located in other groups (the possibility of so moving was held out to certain sub-groups) tended to utilize communication as a substitute for actual upward locomotion.

3. High status persons were restrained from addressing criticisms of their own jobs to lower status groups, and it was postulated that high status persons did not take actions which would demean them in the eyes of others.

4. High status seemed to give such persons greater freedom to criticise low status persons directly.

5. Group cohesiveness was impaired by the perception of persons at other levels as threatening one's own desirable position or as occupants of coveted but unattainable positions.

Cohen (1958:41-53) regards hierarchical status as being of at least two types: that based on social status as in Kelley (1951); and that based on the power possessed by persons at different levels as in Pepitone (1950), Hurwitz, Zander, and Hymovitch (1960), and Zander and Cohen (1955). Cohen summarizes his own conclusions as indicating that those who possess low rank but who are upward-mobile tend to communicate in such a way as to protect and enhance their relations with high-power figures. Those who are of low rank and who find upward mobility impossible, do not need to communicate in a similar friendly, promotive, and task-oriented fashion.

Read (1962), studying upward communication in actual industrial settings, found that the motives and attitudes of organizational members were important modifiers of the accuracy of communication, and related to the degree of inter-personal trust held by executives for their superiors, and perhaps also to the perceived degree of the influence of the superiors by the subordinate.

Directional approaches and technology. Simpson (1959) investigated vertical and horizontal communications in a textile mill and suggested the following hypothesis to explain his findings: mechanization reduces the need for close supervision, which is equated with vertical communication, since the work pace is set by the machines; but automation (i.e. extreme mechanization) increases the need for vertical communication to deal with frequent and serious breakdowns.

Other comment on vertical approaches. Certain general comments on horizontal and vertical communication, not necessarily based on reported research, are of interest. Merrihue (1960:155) states that:

> Horizontal communications in most companies is atrocious, despite the great interdependence of the various functions. As a result, employees in the various functions erect elaborate channels to compensate for the lack of formal lateral channels between functions and between positions at the same level.

This observation is confirmed by Burling (1954) who notes that "in the hospital studies, we found that established provision for vertical communication was much more developed than for horizontal communication." Koontz and O'Donnell (1959:421) indicate forms of compensatory mechanisms for lack of adequate horizontal channels:

> Crosswise relationships occur in any organized enterprise between the subordinates of a given manager and the personnel in other divisions who may occupy positions of equal, lower, or superior status. Direct communication of this type is a substitute for following the chain of command upward through one or more superiors, horizontally across a level of organization, and thence downward to the individual in question.

Katz and Kahn (1966:239-245) state that communications from superior to subordinate are generally of five types: (1) specific directives, (2) information to produce better understanding of the job, (3) information about organizational practices (4) feed-back to subordinates about job performance, and (5) indoctrination of organizational goals. They state that communication from the subordinate upward can be reduced to what a person says about himself, his performance and problems, about others and their problems, about what needs to be done, and about organizational practices and policies.

Directional approaches and organizational communication. The classification of organizational communication into that which is directed vertically or horizontally may be of value for the behavioral insights which have been brought to light. However, the divisions are too broad to be considered as a system of classification of communication networks, though the existence of a network or networks is implicit in the methodology. The directional approach does possess the merit that it is applicable to examination of communication in the field, and it is possible to break down the broad categories into finer sub-divisions, as has been demonstrated in the following chapter.

Sociograms

The sociogram as a device for representing sociometric data was pioneered by Moreno (1934) who illustrated choice and rejection in interpersonal relations by a map in which points representing subjects were connected by lines indicating either preference or rejection. The number of lines intersecting at any point indicated the relative popularity, or the reverse, of subjects. The technique is appropriate to the study of communications, though where the interactions of large groups are concerned, the resultant map is apt to be cumbersome. Thayer (1961:268) goes so far as to define a communications net as "a quasi-sociometric description of communication pathways among individuals in an organization." Dorsey (1957:324) states that "Relatively stable net patterns can be traced by the use of interviews, sociograms, and simple observation."

In the interest of clarity an illustration of a contrived sociogram is given.

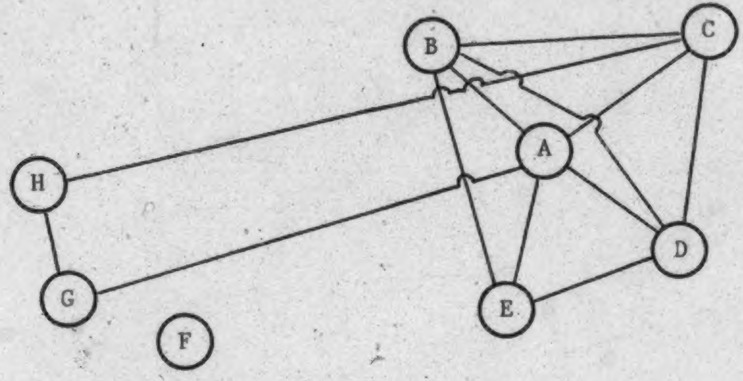


Figure 7

A Contrived Sociogram

In explanation, the above Figure 7 represents that:

A has five respondents, B,C,D,E,G,

B has four respondents, E,A,D,C, as have D and C,

E has three respondents, B,A,D,

H and G have two respondents, and

F is an isolate.

This approach is network construction is based on data which are generally aggregated and unspecific. It tends to ignore such issues as who initiated communication, and in what sequence it was disseminated or what hierarchical rankings were involved. A recent study by Kelsey (1971) illustrates the study of communications by the use of sociograms. Data were collected by means of such questions as: Who do you talk to? How frequently? What about? If you have problems, to whom do you go for help?

The sociogram, as a device for the recording of communication networks has certain serious defects:

1. The map itself may be drawn in many different ways, so that a given condition does not result in a given configuration.

2. The resultant maps do not lend themselves readily to convenient description and classification.

3. Although the map may indicate who has communicated with whom, it does not represent any sequence of such communication nor consider any reason for, or response to, such communication.

In short, while the sociogram may admirably represent such aspects of behavior as popularity or prestige, it appears in some respects inadequate for the analysis and classification of communications in formal organizations.

Sociomatrices

The sociomatrix is a device for representing essentially the same data as the sociogram in the form of a matrix. The pioneers of this approach appear to have been Forsyth and Katz. (1946) The simple "flat" matrix may be considered as a grid where the two axes are the names of the subjects in the same sequence. The choice or rejection of one subject by another is indicated by the entry of an appropriate sign at the intersection of the row and column which refer to the two subjects. An extremely simple form of the "flat" sociomatrix is shown for the purpose of clarification.

	A	B	C	D	E	F
A	0	1	1	0	0	1
B	1	0	0	1	1	0
C	0	1	0	1	0	0
D	1	0	0	0	1	0
E	1	0	1	1	0	0
F	0	0	1	1	0	0

Figure 8

A Contrived Sociomatrix

The above matrix may be read as "Choice by" with reference to the horizontal row of letters A to F, and as "Choice of" with reference to the vertical row of letters A to F. Thus C chooses A, E, and F while rejecting B, C, and D. By varying the sign at the intersection of row and column other data may be added, as, for example, by a number which indicates the strength or frequency of preference or communication. Where subjects choose each other reciprocally, an element of a clique may be identified; thus, in the above figure, A and B are reciprocal choices while A and C are not.

Since cliques are not restricted to two persons, further analysis may be employed to identify extended cliques or subgroups. The basic techniques for this further analysis were developed by Festinger (1949), Luce and Perry (1949), and extended by Glanzer and Glaser (1959) and by Blocker, McCabe, and Prendergast (1964).

In brief, the first power matrix discloses the reciprocal links, and by squaring and cubing the matrix, two-step and three-step links may be identified. The diagonal of the matrix is used to indicate the number of reciprocated choices in which subjects are involved. In the cubed matrix, three-step links are revealed, and the entries in the diagonal will disclose the number of three-step links from the individual back to himself, as A - B - C - A.

A summary and discussion of sociometric techniques is made by Glanzer and Glaser (1959), and includes matrix manipulation, matrix multiplication, vector analysis, and graph theory. In general, these techniques may be used to detect influence structures, reliance on power figures, the existence and description of cliques and other sub-groups, and general communications. Blocker, McCabe and Prendergast (1964:10) define a communication net as all the members who nominate member X as a respondent, and refer to "scope" as "the number of persons with X as the apex." In these terms the net would appear to be regarded as a number and hence could not be classified as a configuration.

These techniques may be somewhat restricted in their utility as devices for examining communication by the type of data that can be represented in a matrix cell. Frequently these data are dichotomized as "speaks to" or "does not speak to," or "likes" versus "dislikes." The input data appear to be both aggregated and generalized. Sample questions from recent studies may illustrate this contention: Francis (1970) asked "Who is your best friend?", "Who do you visit most frequently?". Miklos and Breitkreuz (1968) asked "With which individuals are you most likely to socialize informally during noon hours and/or before and after school hours?" Such sociometric-type questions do not appear to be designed, nor were they intended, to trace the paths and sequences of particular communication channels in formal organizations. The techniques appear to be effective in tracing "the major facts about the transmission . . . of rumor" (Festinger et al.:1948), the acceptance of new drugs by physicians (Menzel and Katz:1955), and the investigation of person-to-person communication (McCleary:1957).

Other Literature

This section will note various observations on communication networks which either stand alone as comment but which are not incorporated into a developed theory, or which are more extensive but which do not fit into one of the preceding categories.

A considerable literature identifies some aspects of the communication network as being identical with the table of organization. Thus Kelly (1969:461) states:

Communication net is a term to describe the arrangement of information channels. In a business, organization charts may be thought of as devices or visual aids used to spell out or make explicit the structure of the management team and to show how information should flow through the firm. It follows from this that the organizational structure may be thought of as synonymous with the communication chart.

Redfield (1958:8) notes that "The entire organization, as it appears on an organization chart, can be referred to as a positional communication net." Simpson (1959:189) writes that "From the literature one infers that most communications not only should be, but are, vertical rather than horizontal, but this appears to have been assumed, not demonstrated." Thayer (1961: 210-219) states that the most common classification [of communication channels] is that of "formal" and "informal," but that a more useful distinction can be made between organizational, intra-group and inter-group, and interpersonal channels. The distinctions made by Thayer are not further elaborated. Melcher and Beller (1967:41) define formal channels as those which coincide with the formal chain of command, and utilize four specific channels, termed "Official," "Unofficial," "Official then Unofficial," and lastly, "Unofficial then Official." These terms are not defined with any precision. All that can be stated is that the terms and definitions proliferate according to the genius and purposes of their authors.

Some references are made in the literature to "cross-wise" communication. Fayol (1949:34-36) noted that much unnecessary effort may be avoided by cross-communication (Fayol's bridge) and gave guide lines for such communication to be incorporated into company policy as a good management device. Katz and Kahn (1966:247) refer to "Another type of communication flow, thus far not considered, [which is] criss-crossing, in which a subordinate in one unit talks to the boss of another unit or vice versa."

There does appear to be a certain connotation in some literature that certain channels are in some sense legitimate, while other channels are somehow underhanded but more effective, Guetzkow (1965:545) refers to "the difficulties which may be encountered when the formally prescribed methods of communication are at variance with the informal, operating actualities in an information system."

Conclusions

In this section, mention has been made of some of the various channels described in the literature, including vertical, horizontal, cross-wise, formal, and informal channels. The literature surveyed does not appear to describe with any precision, or in other than very general terms, any basis for the classification of networks of communication on the basis of their configuration. The sociogram and sociomatrix do provide for the recognition of cliques and sub-groups, but do not allow for the examination of such questions as the following:

1. At what point in the communications system do messages originate?

2. What kinds of messages reach the sub-groups, and what action do they take on receipt?

3. In what sequence do clique or sub-group members receive messages?

4. What are the relationships between the table of organization and the various communication nets?

5. In what circumstances are various communication channels employed?

6. Does the administrative style of a manager influence him to utilize characteristic communication channels?

7. Does the degree of mechanization, the organizational task, the degree of urgency with which the organization is confronted, modify the communication network usage?

The techniques which have been reported in this chapter do not appear designed to investigate these questions. Other, or additional techniques, must be devised and employed.

CHAPTER 3

THE THEORETICAL FRAMEWORK OF NETWORK CLASSIFICATION

The purpose of this chapter is to devise a theoretical classification of communication patterns in formal organizations. Broadly speaking, two alternative modes of procedure were available. On the one hand, an examination of communication acts in formal organization might lead to a system of classification; and on the other hand, a theoretical classification might be devised and subsequently tested for "goodness of fit" with conditions investigated in the field. The first alternative was dismissed, for no adequate pre-existing and readily identifiable description of communication patterns had been located in the literature which might serve as material to be classified. The second mode of procedure was therefore chosen, and a system of classification devised which appeared adequate to describe any and every channel which might be employed in a formal organization, given that communication was restricted as referring only to verbal actions.

Communication channels may be regarded as a system for collecting and distributing information. In formal organizations the table of organization locates the communicating stations in a fixed pattern, and the problem was then considered as being, in essentials, how flows of communications between stations of known location might be described. River systems collect and distribute water, and leaf venation systems distribute sap, and both offer parallels between natural processes and organizational communication. Further investigation of the fields of geomorphology and botany provided a basis for an initial classification of communication patterns, which might, with suitable extensions, serve to describe any and all communication networks in formal organizations.

In particular, the terms "dendritic" (branching) as applied to river systems, "reticulated" (of a net-like appearance) drawn from leaf venation patterns, and "palmar" (resembling the bones of the hand or the leaves of a palm tree) were noted as being applicable to the description of communication networks in addition to their botanical or geomorphological contexts.

The development and amplification of these terms was effected by considering communication networks in a contrived hierachical organization of simple and symmetrical configuration.

DENDRITIC PATTERNS

The Basic Dendrite

The first proposed model was that of a centralized Weberian bureaucracy in which each hierarchical position from the apex controls two (or more) subordinates, and there are three such hierarchical steps.

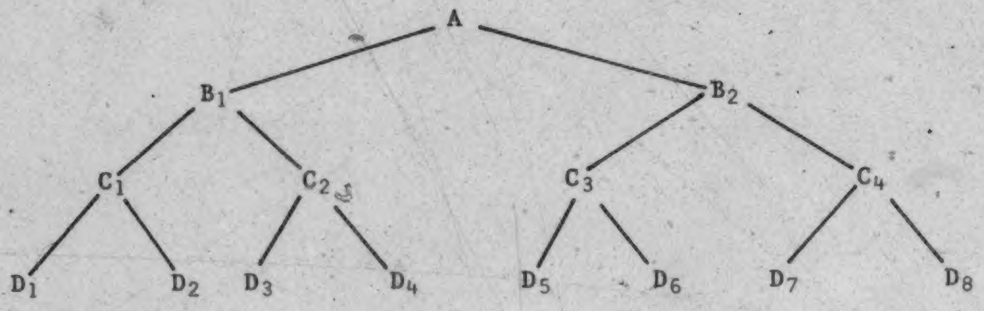


Figure 9

The Basic Dendrite

The pattern displayed above is symmetrical but need not be so. A table of organization is represented in which no station has two direct immediate superordinates. Only one superordinate, A, is responsible for overall control of the system. If the communication system duplicated the formal channels of authority, then A alone is able to effect co-ordination of the whole since only he has the formal capacity to have access to all information in the formal channels. In terms of management science, the communication patterns are logical in that they duplicate the patterns of hierarchical authority. Such patterns are common in leaf structures, and are also applied to drainage systems; they are *dendritic* or branching. In a "pure" centralized bureaucracy, the "feedback" channels would be the duplicate of the "order" channel, but with a reversed hierarchical gradient. This basic model has thus generated two elements of a communications typology, based on a configuration (dendritic) and a gradient (upward or downward), which correspond to a practical and identifiable organizational theory, and to a particular set of circumstances or personal style of administration which demands or prefers authority, control, secrecy, and accountability.

Some Suggested Uses of the Basic Dendrite

The basic dendrite is applicable to spy networks and to other organizations where secrecy is vital. No element at the level of the D (operative) stratum is able to compromise more than one higher agent, and this risk might be minimized by appropriate "cut-outs." The whole system is known only to one master controller at the A stratum. In industrial organizations, the dendritic system corresponds with the doctrine of unity of command, centralized decision-making, and strict compartmentalization. It is also applicable to certain military practices where rapid decisions and instant obedience are necessities for critical action.

Variations of the Dendrite

Certain other patterns of a vertical nature, that is, involving communications between strata in a formal organization, but excluding those within the same stratum may be readily described and named. A communication originating with A, and directed to all stations in every stratum simultaneously, as where a public address system is used, or a notice sent "to all staff," ignores the subordinate hierarchical stratification of the organization, and in effect reduces all B's, C's, and D's to a common level, may be referred to as a "contracted dendrite" from a higher to all other strata combined. Thus:

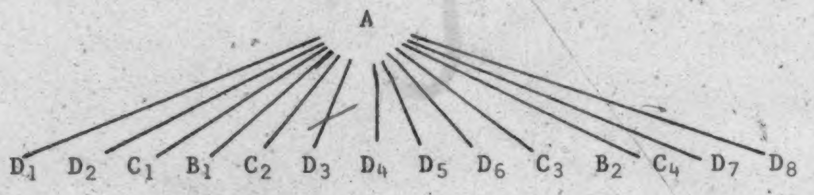


Figure 10

The Contracted Dendrite

The fully extended dendrite would require that A address the B's, who would address their respective C's, and thus to the D's, without by-passing strata and observing the hierarchical niceties.

It will be observed that the patterns between stations of one stratum and the linked subordinates on the next lower stratum form a "fan" of two (or more) rays or channels compatible with the dendrite. This *Dendritic fan* is distinguished from fans which pass from a higher stratum to a lower, but which omit intermediate hierarchical positions, as when A communicates direct with the C stratum without his message passing through the B_1 or B_2 stations as illustrated in Figure 11 below.

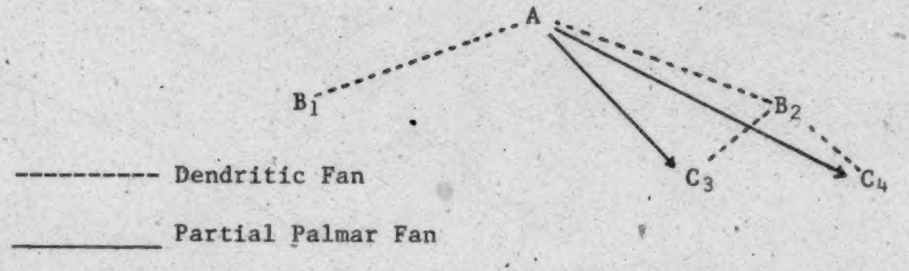


Figure 11

A Partial Palmar Fan

Such communication is non-dendritic by the omission of the B_2 station, and may be described as a partial *Palmar Fan*. In a short-hand notation, $A:B_1,B_2$ is a dendritic fan, but $A:C_3,C_4$ is at once identified as a partial palmar fan by the omission of stations on the B stratum. It is again obvious that since downward palmar communication patterns require the involvement of three strata at minimum, the lowest two levels of an organization are debarred from initiating this mode.

Upward Communication Patterns

Most upward communication may be divided into "feed-back" and "non-feed-back" modes. Concerning the first, which is defined in this study as explicit response to a communication from a higher stratum, classification is made in terms of reversals of the channels referred to above. Thus $D_5:A$ is a reversed palmar ray, $C_4:B_2$ is a reversed dendritic ray. In the "non-feed-back" mode of upward communication, that is, where a communication from a lower to a higher strata is not a response to a previous communication, but a point or location of origin, the same classification may be applied. In the unlikely case of a communication from (say) D_5 to C_3,B_2 and A simultaneously, as when a trooper might say to his assembled superiors "You may do as you will, I will soldier no more," the patterns are of combined reversed dendritic (D_5:C_3), and reversed palmar (D_5:B_2, D_5:A) rays. Each of these modes is compatible with the dendrite, when the omitted stations are considered. Cross communications, as of D_5:B_1, are considered as being outside the dendritic configurations.

Suggested Uses of the Dendritic Variations

The usage of the contracted dendrite have already been suggested; that is, in messages "to all staff" sent by broadcast means or by written messages. Policy handbooks serving as guides to action to all strata would fall within this category. The palmar fan is of obvious value where instructions must be sent with great rapidity to subordinate formations, and the time which would be consumed by "going through channels" can not be spared. The danger exists, in this mode, that by-passed subordinates might be offended by communication made direct to their proper subordinates, and construed as interference with their just authority. Concerning reversed rays of palmar fans, such channels may be employed when immediate information on some critical condition in the field is required at the highest level. In the military, a forward tank may be netted in with a divisional headquarters to pass information of crucial operations direct to higher formations.

Conclusion

The channels of communication which have thus far been considered under the dendritic classification have one structural element in common; they are all *single upward-access* models, in that subordinates can only communicate with one superior, while the superior has multiple downward access within a field of delegated authority. The patterns which are considered within the single upward-access dendritic model are thus summarized:

1. The basic dendrite
2. The contracted dendrite
3. The dendritic two strata fan
4. The palmar three-or-more strata fan
5. Palmar and dendritic rays between two stations on different strata.

Each of these patterns may be considered to have a gradient, dependent on whether the communication is directed upward or downward in the hierarchy.

RETICULATED PATTERNS

The Basic Reticulation

The next general group of cases to be considered were those patterns created by members of the various strata being responsible to and communicating with more than one superior, and when superiors communicate with subordinates who are not within the superior's recognized chain of authority. This is the *multiple upward access* model or *reticulation*, though the net-like elevation of Figure 12 below is not to be taken as a complete representation of reality. Although the illustration of reticulation is of the B and C strata, other reticulations, as of the C and D strata, or partial reticulations as of B_2 and C_1 and C_2 are possible.

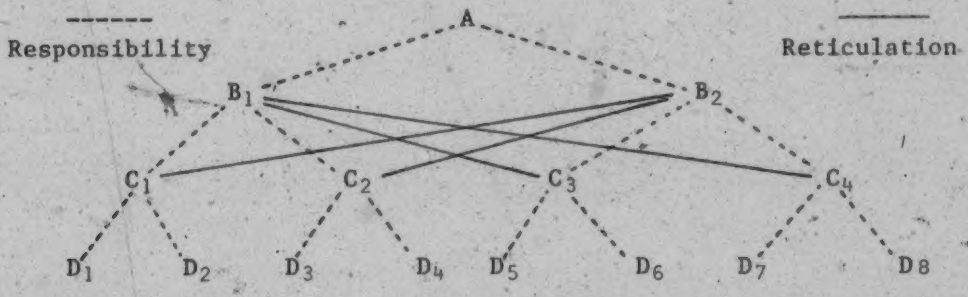


Figure 12

The Basic Reticulation

It will be noted that, unlike the dendrite, the reticulation offers choice of upward access in the illustrated case, from the C stratum stations to the B stratum stations. Whereas the dendritic figure is consonant with the giving of orders from one supreme head to subordinates who have no formal communication with each other, the reticulated pattern allows information from the subordinates of one department to be provided to more than one superordinate, potentially shortening the time-lapse which would be necessitated by the dendritic pattern. It is, in fact, an example and extension of Fayol's "bridge." Where the reticulation is used for command purposes, it results in a form of multiple or dual control, although there is a strong presumption that different sub-systems would be activated from each of the multiple control sources.

Some Suggested Uses of the Basic Reticulation

In military organizations, for example, an artillery forward observation post might provide information to an artillery commander and to the supporting infantry and armoured formations. In business, sales departments might require information from production departments in order to guide current and future activities. In education, under a dual system of control, a superintendent and a secretary-treasurer might require information from the same source regarding the conduct of schools and financial matters respectively. Where, in an industrial setting, the activities controlled by B_1 and B_2 are sequential in nature, B_2 might require regular reports from C_1 and C_2 in order to regulate his supervision of C_3 and C_4. In the model illustrated in Figure 12, only the lower elements of the reticulation have the power of upward selection of channel, and hence the issue of channel selection will be subject to policy decisions within the formal organization if such choice is to be other than random or arbitrary.

Variations Within the Reticulation

As within the dendritic (single upward access) system, it must be expected that certain communications will not conform to the channels indicated on the model; an example might be the ray D_7:B_1 illustrated in Figure 13.

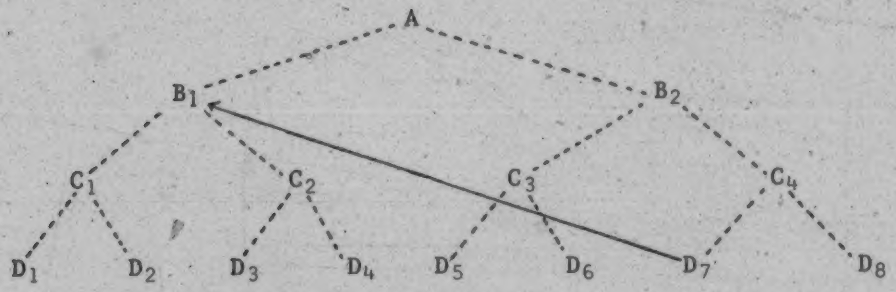


Figure 13

A Partial Reticulation

This channel is not within the dendritic system since D_7 is not within the delinated authority of B_1; the communication is not "through channels." This is considered to be a *partial reticulation* of the B and D strata.

A communication from B_1 to C_3,D_5,D_6,C_4,D_7, and D_8 as illustrated in Figure 14 would be described as a *partial contracted* reticulation if the communication was simultaneous to all strata and stations. If the communication was directed to C_3 and C_4, to be passed on through these stations to D_5 through D_8, the first communication would be reticulated (to the C's) and the second sequences (from C_3 to D_5,D_6 and from C_4 to D_7 and D_8) are obviously dendritic fans.

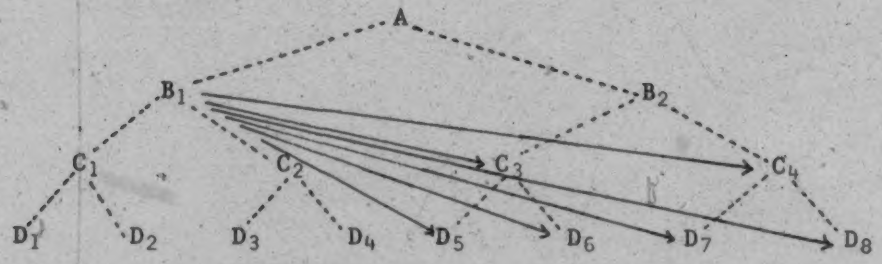


Figure 14

A Partial Contracted Reticulation

It would appear in theory that the reticulated patterns of communication would save time in that a communication from C_3 to B_1 involves only these two stations. If the same message were passed through the dendritic network via B_2 and A, then four stations would be involved. If the message were passed through the palmar network, from C_3 to A and thence to B_1, three stations are involved. Palmar networks, while more rapid than dendritic nets, might also be construed by subordinates as a unwarranted interference in their business and as an aspersion on their competence, as such networks always by-pass a one hierarchical level. The downward reticulation, unless well organized and accepted, also by-passes at least one station whose hierarchical status is equal to the orginator, while the message extends into that equal's domain of authority. Some duplication of work may result from messages being dispatched to more than one superordinate.

Since the lower strata members in reticulated networks have a theoretical choice of upward direction of communication, the "gating" function is inherent. While in the dendrite the gating function allows edition, compression, and suppression, the reticulation permits diversion of information in communications. The reticulated model is one where some decentralization of decision-making is more possible than is the case with the dendrite, since all the ascending information which is available to the A stratum may also be available, collectively, to the B stratum in the diagrammed reticulation. Such a diffusion of information is not needed unless a different quality of decision-making is required and encouraged.

Some Additional Issues

It appears necessary to distinguish at least two modes of information flow through these networks. A superior might send exact, detailed and prescriptive orders through the dendrite allowing no discretion to his subordinates; another superior might send general instructions to his subordinates, perhaps indicating a general intention but allowing subordinates a choice of means by which the intent of the instruction might be attained. The first mode will be referred to as "*Feed-through*," in that the subordinate strata are mere vehicles for the passage of prescriptive orders; the information feeds through their stations. The second mode will be referred to as "*Feed-on*," in that the subordinates augment and particularize the general intent; they add on to the communication.

Thus far the argument has tended to demonstrate that the dendrite is especially suited as a configuration to the purpose of close *control*, while the reticulation allows *co-ordination* of sub-systems at levels below the apex. Neither model provides an inherent capacity of *co-operation* between equals. Figures 9 and 13, the basic dendrite and the basic reticulation, do not permit horizontal communication; they are essentially "elevations" of communication systems viewed from a "side." Communication models which are predominantly "horizontal" can only be clumsily represented by "elevation" models, because a multiplication of lines representing horizontal communication between equals will tend to obscure the essential elements. A new model, essentially horizontal in conception, is needed.

THE HORIZONTAL COMMUNICATION MODEL

The Contoured Communications Map

When members of a formal organization communicate with each other and occupy positions of equal hierarchical status, a horizontal mode of communication exists, and the patterns which can emerge are extremely simple in conception. For the purpose of examination let us assume the existence of five hierarchical equals in communication with each other, and let these be represented as stations on the periphery of a circle as in

Figure 15. The locations are arbitrary and do not represent a seating arrangement.

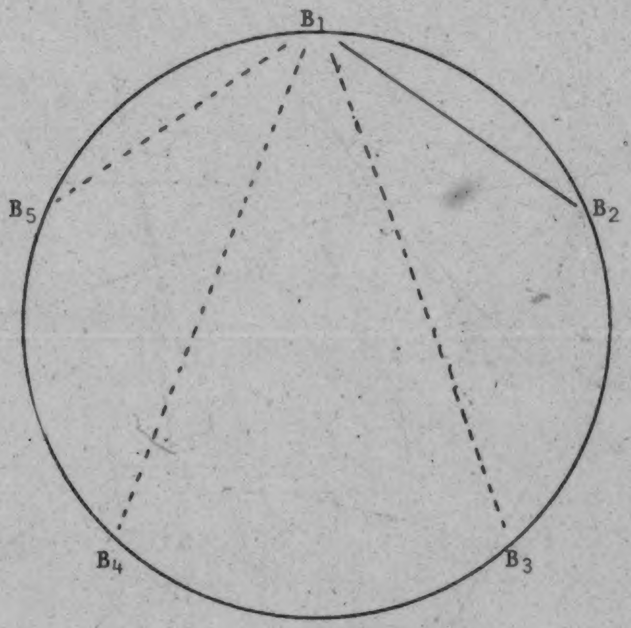


Figure 15

Horizontal Communication Patterns

From whatever station a communication originates, it can be only considered as being one of two possible patterns:

1. The communication is directed to one person, and is thus a *horizontal ray* as B_1:B_2,

or

2. The communication is directed to more than one person simultaneously and is thus a *horizontal fan* as B_1:B_2,B_3,B_4,B_5. If any B responds, the patterns are repeated though from a different point of origin. Where, in a lengthy exchange of

of communication between hierarchical equals, every station communicates with every other, the resultant map will be an All-channel network, resembling a star with peripheral closure, as in Figure 16.

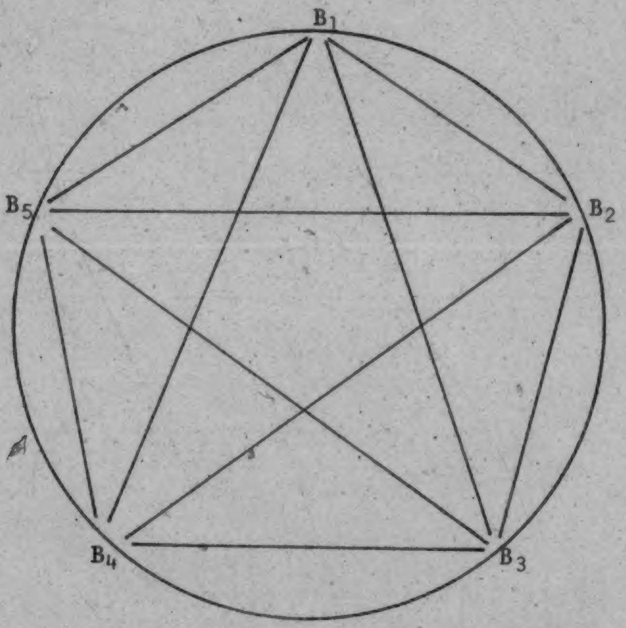


Figure 16

The All-channel Network

The map of horizontal communications may be modified to allow representation of communication involving two or even three strata. For this purpose concentric rings are used as in a polar co-ordinate projection. The resultant map resembles a contour map and will be referred to as such.

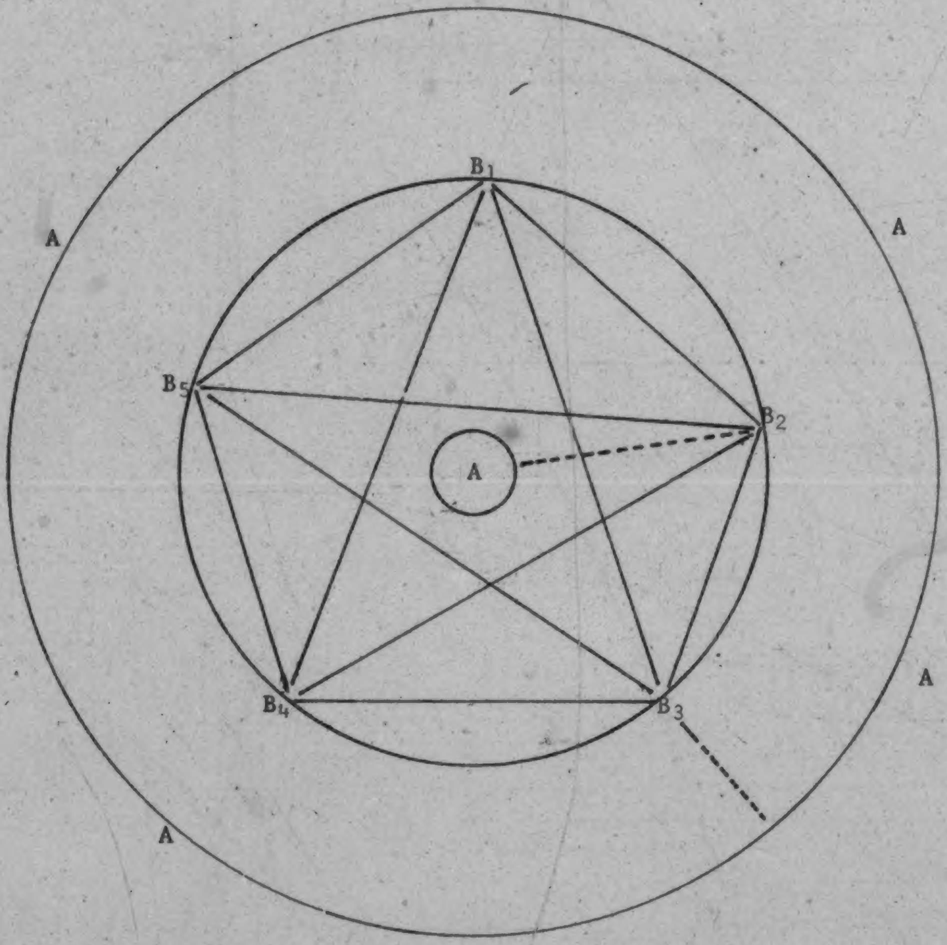


Figure 17

The Contoured Communication Map

In Figure 17, the solid lines indicate all possible communication channels between five stations of equal hierarchical status. The broken lines present two options whereby communications involving two strata may be shown. A, a superior or an inferior, may be indifferently located at the center of the contours or be regarded as occupying the entire periphery. The line from B_2

to the central A, or from B_3 to the peripheral A, is an alternative way of illustrating a dendritic ray.

The entire table of organization could be represented as a polar co-ordinate figure instead of the usual "side view." Were this done, the lines connecting communication channels between the hierarchical levels located on successive contour rings will tend to be inconvenient, particularly in diagramming reticulations.

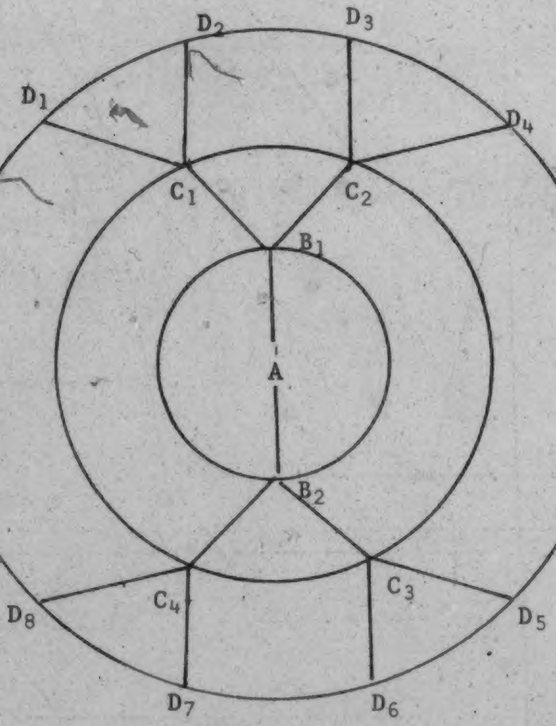


Figure 18

A Polar Co-ordinate Table of Organization

Figure 18 replicates the relationships exhibited in Figure 9 but represents the hierarchical levels as being on concentric contour rings rather than on successively lower or higher levels. The figure is not convenient for representing multiple upward access communications.

Uses of Horizontal Communications

Whereas the dendrite seems well adapted for purposes of control, and the reticulation for purposes of co-ordination, horizontal communication patterns seem well suited for the purpose of co-operation between equals; that is, to a collegial mode of operations. Horizontality implies the communication of equal with equal in hierarchical status. No one person can dominate such communication by reason of superior formal status. However, contours of personal ascendance may have been established or may emerge from the basic horizontal pattern on the basis of expertise, popularity, education, or other factors. Thus the situation, of communication between hierarchical equals, may change to one of unequal contour location, which may be expected to modify the theoretical equality of hierarchy and hence effect the communication patterns. This issue will require a form of interaction analysis before location on appropriate contours may be tentatively investigated.

The uncontoured meeting or exchange of communication assumes exchanges between equals without conditions of dominance or submission, and with a free give-and-take, open argument, and decisions made on the basis of consensus of majority vote. As such, the pattern would appear to be typical, not only of collegial operations, but also of the communication between the staff expert or professional person in relation to line officers, where advice may be given and also rejected; it is not a system where instruction and orders may be issued. Processes in it may be time-consuming, but agreement reached within the horizontal system may have a superior quality in that they are the product of intelligences working in conditions without constraint of status relationships; issues may be freely discussed, and if not agreed to by all, they are at least understood by all, and so more likely to emerge in an atmosphere of good-will rather than one of centralized dominance. The possibility exists in these circumstances that a decision is the result of the lowest common multiple of the combined talents though the highest common factor may also emerge, especially in a high-risk situation.

Dual Systems of Contoured Communication

Brief mention has been made above to contours which may emerge on the basis of personal ascendency or expertise as opposed to the formal contours of hierarchical authority. These two patterns may be activated simultaneously, and may both support, or oppose each other, as when a superior line officer over-rules a subordinate expert. Again, industrial organizations may have a well defined trade union or professional communication network which may be discontinuous with the formal hierarchical contours of communication. That is, although the union communication may have a hierarchical form of its own, from the viewpoint of the formal or parent organization such union communication within the organization will be contoured rather than hierarchical. Union communication may be partly within and partly without the communication system of the parent organization, and may thus be considered from that standpoint as being partly informal and partly formal. That union communication which is within the concerns of the parent organization is not expected to follow channels of the formal networks in all cases or even in many cases. They may be mapped on a table of organization of the organization, but no expectation can be held that such mapping will reveal any consistent basic patterns such as have been postulated. Such unpatterned networks may be termed *adventitious* in relation to the basic organizational task-oriented communication networks. At the same time such union or professional communication channels, when mapped according to the union or professional hierarchical organization may be realistically expected to conform to the patterns postulated for formal organization. Thus the possibility exists that two or more systems of communication networks or channels may be activated in an organization simultaneously, which are patterned in relation to their own context, but not in relation to each other.

Intermittent Contour Changes

From the above arguments on the differences between hierarchical and contour status, it may be postulated that in any active communication network there may be constant or intermittent change in the gradients as the contours shift from the context of authority to those of personal ascendancy. For example, at a school board meeting with a superintendent and a secretary-treasurer present, the nominal contours of hierarchy indicate that the board is composed of superordinates, and the two officials are subordinates. Where the board issues directions, the nominal contours are actual. When, however, the secretary-treasurer states that in his opinion a certain financial or accounting process is ill-judged; or when the superintendent states that a course of action is contrary to acceptable professional practice, the expertise contours may become more prominent than those of authority. Viewed in this manner, such encounters take on some aspects of a stratographical map, where beneath the observable surface, submerged strata form *synclinal* and *anticlinal* folds. Such geological terms are of value in adding insight to certain communication situations. Where a superordinate, or superordinates, is in a position of nominal control of a communication event or situation, but where the actual power, either of influence or expertise, resides with the subordinate or subordinates, a synclinal situation results in that the nominal contours are reversed; the superordinate is not at the apex of a "cone" but at the base of a "saucer" or syncline. Similarly an anticlinal situation would exist where a person who is perceived to be nominally or in one particular context to be at the base of the contours, is actually in control of the situation.

In some situations deliberate attempts may be made either to create new contours or to erase existing ones. A superordinate, finding that strongly centralized dendritic modes of communication either arouse resentment or are inappropriate to the perceived situation, or are even out of fashion, may wish to switch his communicative style to a permanent or temporary collegial mode with an emphasis on horizontal uncontoured communication. This may take time to implement since the contours to which he may have become habituated, and which are perceived as an enduring pattern by the lower strata of the organization, may persist in spite of his declared wishes. Confusion may result in the minds of his subordinates because the networks remain structured in their perceptions in spite of the declared wishes of the superordinate. Thus, in a school situation, a principal may have difficulty in appearing credible as a colleague in desiring his confreres to consult freely with him, if in other contexts he has demonstrated a strong penchant for command and direction through a dendritic pattern. It may be that persons of a certain personality or training are not capable of operating with conviction in certain communication patterns.

CONCLUDING REMARKS ON COMMUNICATION PATTERNS

Thus far the models considered in this chapter are capable of generating all the figures to which reference has been made in the general texts relating to small group patterns, while they additionally retain added capability for application in different circumstances. Reference has been made to the "wheel," the "Y" network, the "chain," the "circle" and to the "all-channel" networks as illustrated in Figure 6 above. With respect to the "wheel," this is a contoured figure in that a central station has access to four channels while the other stations have but one channel each. The wheel may then be regarded as a communication network relating one station from a higher or lower stratum with four stations from a lower or higher stratum; as a two strata dendrite; as a contoured horizontal figure without peripheral closure, or as an "elevation" or "side" view of a reticulated network spanning three strata. In terms of Figure 13, the "wheel" might represent the reticulation B_1,B_2,C_2,D_3,D_4. The "Y" network might be dendritic as A,B_2,C_4,D_7,D_8 in Figure 9, or alternatively it might be illustrative of a negatively graded (from a lower to a higher stratum) network in that if the "Y" is read bottom to top, there is a choice of upward channel from the third to the fourth station. The "Y" figure is also applicable to certain options in the horizontal contoured figure with peripheral closure. Each possibility could be demonstrated if the contours were known. The "chain" might be abstracted from the dendrite, the reticulation, or from the horizontal and contoured figure; it consists of four successive single choice channels without closure. The circle is also applicable to all three systems, but it has closure. The "All-channel" network replicates Figure 16 above. The application of the conception of contouring by hierarchical status or by some aspect of personal ascendancy retains all the utility of the original small group figures, but adds, as has been remarked, the possibility of additional explanatory utility to the investigation of communication patterns in formal organizations.

The theoretical framework developed in this chapter has involved classification of communication channels into three broad divisions: those single upward-access patterns based on the dendrite, those multiple upward access patterns based on the idea of reticulation, and those channels which are basically horizontal as regards hierarchical status but which may be "contoured" in terms of expertise or personal ascendancy. These three broad divisions, with their variants, appear adequate to define any communication made formally in any hierarchically structured organization. The concept of "contouring" in horizontal communication admittedly does not lead to patterns which may be defined before the event. The contours of personal ascendancy may perhaps be perceived by analysis of exchanges between hierarchical equals, such as has been devised by Bales

(1966:94-102) or by others. The hypothesis can be made that the organizational member who initiates a verbal or written move that results in a decision might be located on a contour, which, in respect of decision-making in that situation, is higher than the contour of a member whose moves do not so result. Whether location on a contour is stable over time and changing contexts would appear to be a legitimate theme for investigation. The study performed by Holdaway (1968) tends to suggest that the contours of "expertise" or "decision-making" in school board meetings may be fairly stable.

In terms of the Lasswell formula "*Who* says *what* through *what channels* to *whom* with *what effect*," there are five issues to be defined. The issue of the "Who" and "to whom" may be readily ascertained by tape recordings or by the examination of correspondence; the "what" is a matter for appropriate content analysis, for which various techniques exist; the issue of "by what channels" has been defined in terms of some precision in this chapter; the issue of "with what effect" is unresolved, since an overt action or reaction may be perceived readily, but psychological "effects" may elude recognition, definition, and assessment.

SUMMARY OF CHAPTER 3

In this chapter, terms were taken from the disciplines of geomorphology and botany and applied to communication networks. The basic terms of the dendrite, of reticulation, and of palmation were augmented and expanded as required by their relation to communication networks in a hierarchically structured organization. In a leaf, sap is assumed to flow through all channels. In organizations, communications flow intermittently and selectively. The botanical model serves as a starting point but has limitations.

Specifically, the following terms were devised:

1. Under the single upward access model
    - (a) Basic dendrite
    - (b) Contracted dendrite
    - (c) Dendritic fan
    - (d) Dendritic ray
    - (e) Palmar fan
    - (f) Palmar ray
2. Under the multiple upward access model

    The basic reticulation, directed cross-wise to superordinates or subordinates other than those to which or for which the originator is directly responsible.
3. Under horizontal communications between hierarchical equals
    - (a) Horizontal ray
    - (b) Horizontal fan

4. Differentiation was made between "feed-on" and "feed-through" modes of communication. The first implied discretion to augment and particularize instruction from above, while the second denied such discretion.

The botanical and geomorphological terms and their extensions apply to communications between superordinate and subordinate. Where persons communicate with their hierarchical equals they are not applicable because the framework of a chain of authority is absent. In circumstances of equal hierarchical authority only two patterns of communication network may be employed, the horizontal ray to one other person, and the horizontal fan to more than one other person. These two latter networks supply a very limited framework for hypothesis and investigation, and the suggestion was made that horizontal communication patterns might best be investigated by employing a form of interaction analysis, perhaps on the basis of frequency and content of communication.

The concept of contouring the communications on the basis of expertise or popularity might add dimensions to the investigation of horizontal communication which are lost in the absence of formal hierarchical status.

CHAPTER 4

A COMPARISON OF TECHNIQUES OF ANALYSIS

The purpose of this chapter is to compare the results of three methods of analysis of communication: (1) by construction of a sociogram, (2) by "clique" analysis, and (3) by a "mesh analysis" of identical data. These data were contrived, that is, they represent a series of imaginary communications between members of a hypothetical organization. The communications were designed to be formal and work-oriented. The comparison was not intended to demonstrate the superiority of one technique over another, but to illustrate that, with the two techniques previously available, the sociogram and clique analysis, the possibility exists that without suitable care in framing the conceptual theory, misleading conclusions may be drawn. As noted by Swift et al. (1972:5) commenting on Paisley's (1968) views on methodology, "He notes that sound methods . . . . can ensure valid data, but valid data do not ensure valid conclusions in the absence of adequate conceptualization." Again Swift et al. (1972:10) state that "When we come to the conclusions as a basis for decision making, data and the conclusions to which they give rise (or more accurately explanations imposed on data) have validity only in so far as the initial conceptual model appropriately represents the 'real' situation."

In this chapter, an artifical "reality" is postulated, three techniques of data collection and analysis are demonstrated, and the conclusions are compared with the original "reality." There is no implication that other investigators have erred in their conceptualization, data collection, or analysis of any other situation.

The Hypothetical "Reality"

A formal organization is postulated with the identical chain of command or table of organization illustrated in Figure 9. In one day the following communications are imagined to occur:

a) From A to B_1, B_2. "Please inform your C's, and have them pass it on to their respective D's, that the shop will be closed at noon next Friday." Each C and each D communicates as instructed.

b) B_2 to C_2. "Please inform D_3 and D_4 that, as they have been summarily dismissed, they may pick up their pay at five o'clock today."

c) D_3 and D_4 to A. "We have been most unjustly dismissed as of today. We protest this decision and demand at least one week's notice."

d) B_1 to B_2. "I am losing D_3 and D_4 today. Have you any good men who would care to transfer from the foundry to the machine shop."

Analysis by Sociogram

Imaginary data are assumed to have been collected from the stations postulated on the basis of the following question:

"Indicate on the matrix provided the names of people with whom you have had communication today. A communication is defined as an occasion on which you have spoken to someone, or someone has spoken to you on work-oriented matters. Indicate who initiated the exchange."

The data collected would provide the following raw data for the sociogram:

A had communicated with B_1,B_2,D_3,D_4

B_1 had communicated with A,B_2,C_1,C_2

B_2 had communicated with A,B_1,C_2,C_3,C_4

C_1 had communicated with B_1,D_1,D_2

C_2 had communicated with B_1,C_1, D_3(twice), D_4(twice)

C_3 had communicated with B_2,D_5,D_6

C_4 had communicated with B_2,D_7,D_8

D_1 had communicated with C_1

D_2 had communicated with C_1

D_3 had communicated with A, C_2(twice)

D_4 had communicated with A, C_2(twice)

D_5 had communicated with C_3

D_6 had communicated with C_3

D_7 had communicated with C_4

D_8 had communicated with C_4

The derived sociogram is illustrated below.

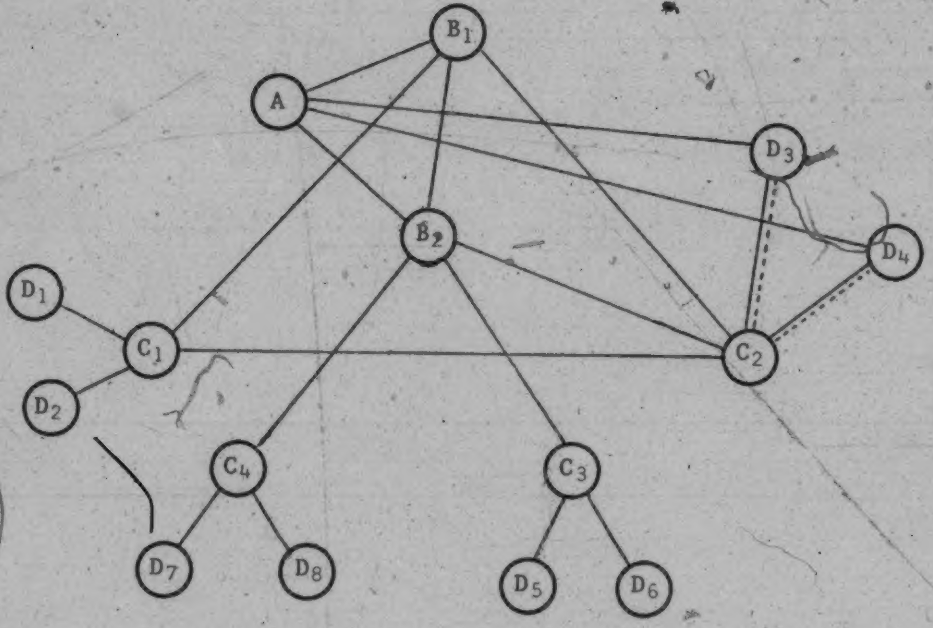


Figure 19

A Sociogram of Postulated Data

The broken lines between D_3, D_4 and C_2 indicate that account may be taken of the fact that communication occurred between these stations on two separate occasions.

Examination of the sociogram represented in Figure 19 might lead to the following conclusions:

a) By analysis of frequency of communication, C_2 appears to be the central figure with either five or seven communicative actions, but B_2 shares this centrality if only the number of stations is considered. If the thesis that centrality confers power is adopted, then C_2 and B_2 are the power figures.

b) By the same reasoning, A, B_1, C_2 have each four stations with which they have had communication; C_1, C_3, C_4 each have three; D_3, D_4 have two each, and $D_1, D_2, D_5, D_6, D_7, D_8$ are comparatively isolated with but one communication each.

Although the sociogram depicted in Figure 19 might be portrayed in other configurations, it does accurately represent the data collected from the given facts, by an accepted technique. The correspondence between the sociogram and the "facts" is open to serious question. The data stated as the "hypothetical reality" had a sequence, a pattern of delivery, a direction, and a content which cannot be recovered from the sociogram, which has merely abstracted one element from the "hypothetical reality;" that of "who talked to whom." The sociogram, therefore, appears to have limited utility in the analysis of formal communication. For example, C_2 is not necessarily a power figure; he has merely passed on to his subordinates communications which were initiated by his superiors.

Clique Analysis of the Hypothetical Data

The number of persons who may be considered to form a clique is definable in an arbitrary manner; they may comprise links of two, three, four, or more steps. Thus a clique of three steps might be represented as A to B to C and back to A. By this definition cliques of three steps will be abstracted from the data, and followed by the abstractions of such larger cliques as might emerge. The sociometric data were assumed to be those collected for the sociogram; they were simple enough that the need of constructing a sociomatrix was considered unnecessary, and cliques were identified by inspection.

Three-step cliques. Three-step cliques were abstracted from the data as follows:

A, B_1, B_2

B_1, C_1, C_2

B_1, B_2, C_2

B_1 is a member of all three cliques, while C_2 and B_2 are members of two of them.

Four-step cliques. Four-step cliques were abstracted from the data as follows:

A, B_1, C_2, B_2

A, D_3, C_2, B_2

A, D_4, C_2, B_2

A, C_2, B_2 are members of all four-step cliques. No cliques of larger size appear to exist.

This information accurately represents conclusions which might be drawn from the application of clique analysis to the given "facts," but the "reality" cannot be recovered or even recognized from the conclusions. In the case of the first three-step clique, A, B_1, B_2, A did communicate with B_1, who communicated with B_2, who had communication with A~~; but~~ not concerning the same matters. A directed the B's to pass on a message concerning the shop closure; and B_1 communicated with B_2 on recruitment of machine shop workers from the foundry. This coincidence might be defined in some terms as a clique, but does not correspond with the postulated "reality." The same argument applies to all other cliques identified. In the case of the four-step clique A,B_1,C_2,B_2,A communicated with B_1, instructing him to relay a message to C_2 concerning shop closure. C_2 had communication with B_2 concerning the discharge of D_3 and D_4, while B_2 had communication with A, again about shop closure. No four-step clique exists, except in terms which have no meaningful utility. As was the case with sociogram, the clique analysis technique as applied to the hypothetical "reality" may have limited utility in the reconstruction of that "reality." The conclusions that were drawn may appear questionable at least in the context of formal communications in a hierarchically structured organization.

Mesh Analysis Technique Applied to the Hypothetical Data

The criticism which has been made of sociometric techniques applied to the given hypothetical "reality" was substantially that the original "reality" could not be recovered except in terms of "who spoke with whom." The concepts of sequence, channel pattern of delivery, direction, and content were lost, while conclusions might be drawn which were either false, misleading, or meaningless. An effective technique might then be expected to be helpful in recovering and representing more elements of "reality" than an ineffective technique; in short, to be concerned with minimum loss in the aggregated data as regards sequence, pattern, direction, and perhaps content; the conclusions drawn from the use of a more effective technique might be expected to offer a more accurate but simplified model of significant elements of reality, than another technique which is less effective.

Such an analysis was attempted. The four communications postulated as having occurred were analysed as follows:

a) A used a fully extended dendrite in the "feed-through" mode.

b) B_2 communicated by a reticulation to C_2, who relayed information downward through the dendrite to D_3,D_4.

c) D_3,D_4 communicated with A via a reversed palmar fan.

d) B_1 communicated horizontally with B_2.

Given the original table of organization of Figure 9, elements of the postulated communications, that is, their origin, destination, and channel within the organization, can be retrieved or reconstructed in their entirety, though content is lost. When all four communications are superimposed on one figure, the result is as depicted below:

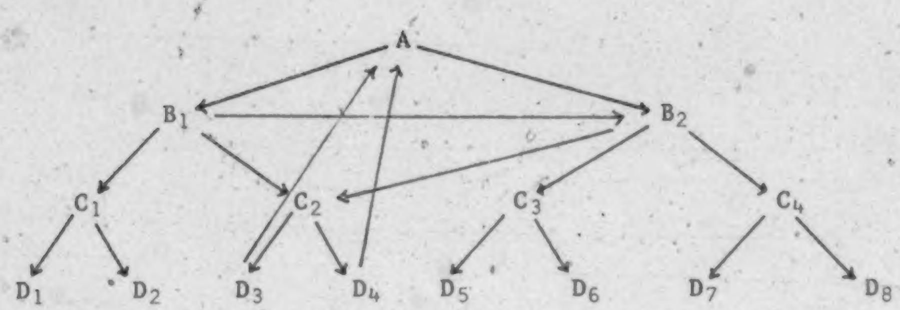


Figure 20

Superimposed Communications Networks

Analysis of Figure 20 might lead to the following conclusions. Communication in this organization appears to be generally dendritic, with partial reticulation between the B and C strata. Palmar communication exists between elements of the D stratum and A. The B stratum stations employ horizontal communication.

Such conclusions are unambiguous and not capable of refutation; dendritic, reticulated, horizontal, and palmar elements, as defined, may be discerned. Aggregation of the data as in Figure 18 has caused some loss of information in that the sequence of messages cannot be determined from the diagram, but the loss of particular detail is counterbalanced by enabling generalizations about the totality of the communication patterns to be made.

Analysis of individual "modes" of communication may be made by consideration of points of origin and employed channels.

Communications originated by A are 100% dendritic

Communications originated by B_1 are 50% dendritic
and 50% horizontal

Communications originated by B_2 are 50% dendritic
and 50% reticulated

Communications originated by C_1 are 100% dendritic
as are those of C_2,C_3,C_4

Communications originated by D_3 are 100% palmar rays
as are those of D_4

D_1,D_2,D_5,D_6,D_7,D_8 originated no communications.

Analysis might also be made in terms of mode of reception of messages, but was considered unnecessary. Further analysis of individual communication "mode" appeared to be unwarranted since the networks employed by various persons might be due to personal preference, to the structure of the organization, to the physical location of personnel, or to other causes, and the given "sample" of communication is extremely meagre. In other circumstances, where additional data were available some inferences as to "causes" of individual style might be made.

Conclusions

A demonstration has been made that the techniques of analysing administrative and formal communications by means of sociograms or by clique analysis may be inappropriate and possibly misleading. Conclusions may be drawn from such analyses that do not correspond with reality, and recovery of the original data is minimal. The use of "mesh analysis" technique to individual or aggregated communication was also demonstrated; recovery of original data appeared to be superior to that effected by other methods, and descriptions could be made as to "mode" which again appeared to be accurate, though no cause for such "mode" could be assigned in the absence of other and supporting data. In such circumstances further examination of "mesh analysis" as applied to communications portrayed in the literature and in functioning organizations is needed.

CHAPTER 5

APPLICATIONS OF MESH ANALYSIS

In the preceding chapter three different techniques were used to analyze a small sample of artificially contrived communications in an imaginary organization. On the basis of this exercise two of these techniques, those of the sociogram and of clique analysis, were rejected as being less appropriate for the examination of formal communication in hierarchically structured organizations than was another technique which had been given the name of "mesh analysis." This latter of the three methods appeared to offer a basis for describing networks of communication employed by individuals and in terms of the organization as a whole, and of developing classifications of communication networks which might be appropriate to the communications of any other organization having a hierarchical structure.

This chapter presents evidence that the classification of communication networks which has been employed in the investigation of imaginary communications in imaginary organizations may be employed in the investigation of real organizations. Evidence will be sought that such investigation may lead to useful insights into administrative communication.

Communications in a Teachers' Organization

Following an investigation of the Communications Department of the Alberta Teachers' Association a report was prepared in April, 1972, (Adams, Bride, Stryde, and MacMillan:1972). This study was designed to replicate the methodology reported by Simpson (1959) and the findings are not of consequence in the present context. However the data collected were capable of analysis in terms other than those of "vertical" and "horizontal" components, as required in the replication.

Summary of Method of Data Collection

Data were collected from twenty-two persons in the organization, spanning four levels of a hierarchy. Each respondent was asked to indicate on a matrix all the communications which he originated and which he received, both orally and in writing, in such a manner that the sources and destinations were presented. The number of messages was also recorded. Certain methodological difficulties occurred, as when persons were absent on one of the days for which records were to be taken, but the data were multiplied in order to approximate accuracy. That is, if data were required on two days, and a respondent was absent on one of these, the single day responses were doubled to give an approximation for the desired two days. The result was the production of four separate sheets of a matrix indicating the number of communications sent out by each respondent orally and in writing, and also those received orally and in writing, with sources and destinations of communications being recorded in all cases. The remainder of that study is not of consequence in the present context.

An Alternative Method of Analysis of Data Collected

The summarized matrix sheets can be examined in relation to the table of organization, and by means of the theoretical framework already developed. Figure 21 below illustrates the Table of Organization of the Communications Department of The Alberta Teachers' Association as in April, 1972. The following description of the various components may be helpful. A is the Associate Executive Secretary, B_1 the Co-ordinator of Communications, B_2 the Executive Assistant (Communications), C_1 the Supervisor of Printing, C_2 the Office Assistant for Council Publications, C_3 the Office Assistant for Publications, C_4 the Assistant Editor of the Magazine and News, C_5 the Communications Assistant. D_1 to D_8 represent the Printing and Addressograph group, D_9 and D_{10} are typists, D_{13} is a stenographer, D_{11} and D_{12} are artists, and D_{14} is a typist.

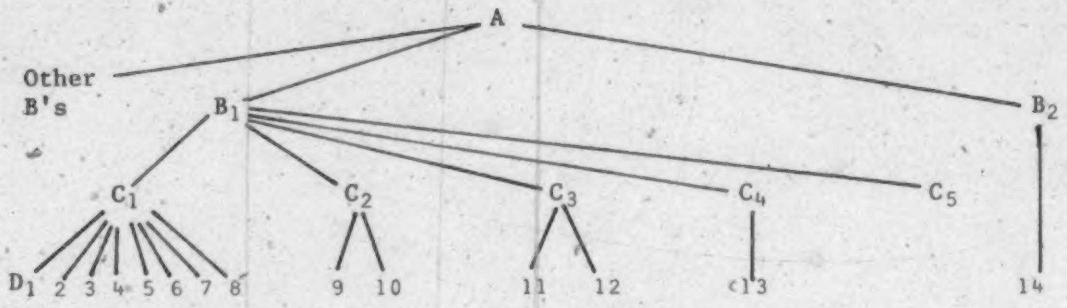


Figure 21

The Table of Organization

When communications are mapped in terms of the Table of Organization, dendritic communications will adhere to the lines of authority depicted above, and, horizontal, reticulated, and palmar patterns may also be identified. Since the method of data collection did not allow for the identification of message patterns which employed "feed-on" or "feed-through" modes, the full range of theoretical descriptions of channels may not be employed in this analysis.

The Analysis of Selected Data

The following analysis is restricted to the two matrix sheets which represented messages which respondents claimed to have dispatched either in writing or orally. For various reasons these data did not correspond exactly with messages which were recorded as being received by the respondents. In the analysis which follows, the assumption was made that the messages recorded as having been dispatched represents the "true" data, and that the differing figures for messages received are in error due to haste or inattention in recording.

The data on the two matrix sheets for oral and written messages were consolidated and are illustrated in Figure 22. The vertical column A to D_{14} indicates the originators of messages and the horizontal row with the same headings indicates the designated recipients. End columns and rows contain the total numbers of messages received and transmitted to a grand total of 616 messages.

It is now possible, by consideration of the data presented in Figure 22 and the Table of Organization presented in Figure 21, to calculate the numbers and percentages of messages transmitted over the postulated and theoretically derived networks, both for individual positions and for the Communications Department as a whole. For example, of A's communications, only those to B_1 and B_2 are dendritic. Of A's twenty-five communications, only seventeen, or sixty-eight percent, are dendritic, while thirty-two percent are palmar. Whether these latter are a series of individual rays or partial fans cannot be determined from the data, which do not distinguish between transmissions sent serially or simultaneously, or between identical and different messages to several recipients.

For the purpose of this analysis D_{14} is assumed to be on the same hierarchical level as other D's, though this former station is but one level removed from A, while the other D's have two intervening levels. Thus communications from D_{14} to other D's will be considered as being horizontal, rather than

RECIPIENTS

ORIGINATORS

	A	B_1	B_2	C_1	C_2	C_3	C_4	C_5	D_1	D_2	D_3	D_4	D_5	D_6	D_7	D_8	D_9	D_{10}	D_{11}	D_{12}	D_{13}	D_{14}	TOTAL 22
A		17				3	1												2	1		1	25
B_1	2		12	6	6	18	10	2		2							2		12	2	18		92
B_2	2	4		2		6		10												6		14	44
C_1		2			6	4			1	3	3	7	8	2			2	5	3	1	3		50
C_2		5	6	3		1							2	1		6	5	1	3	1	1		35
C_3	1	5	3	1			1	2		3	2								5	5	6		34
C_4		3			1	2		2		1									1		6		16
C_5		1	3			4	3										3		2		3		19
D_1				1						6	1	1	1	1	5								16
D_2				1		1			6				4	3	3	1		1		5			25
D_3				4					4	4		3	4	5				4				3	31
D_4		1		10							5		4	2				10					32
D_5				2							2	1		1				6					12
D_6				1						1	1		1		1								5
D_7	2								5	4		1	2										14
D_8		2			2	1	1	2									4				3		15
D_9			1		8	3							1			1				3		2	19
D_{10}				8					2	4	4	8	8	4	2					2		1	43
D_{11}	2	2				4														2			10
D_{12}				2	1	4		3					1	2		1	1		7		2	2	26
D_{13}		2		2		4	5	1		4									4			1	23
D_{14}			6	2		2		6	2					2						8	2		30
TOTAL 22	9	44	31	45	24	57	21	28	20	32	18	21	36	23	11	9	17	27	39	31	49	24	616

Figure 22

The Consolidated Communications Matrix

reticulated as would be the case if the number of intervening levels between D_{14} and A were the determinant of hierarchical status. The results of analysis of networks employed by individual stations are illustrated in Table 1.

The following explanations of headings and items in Table 1 are necessary:

1. "Up" and "Down" refer respectively to the transmission of a communication from a lower to a higher hierarchical position and *vice versa*.

2. "Within Group" and "Among Groups" refer respectively to horizontal communications between stations which are responsible to a common immediate superior, or which have no common immediate superior. Thus communication between C_1 and C_4 is defined as "Within Group," while communication between D_7 and D_{11} is defined as "Among Groups" in that their respective immediate superiors are C_1 and C_3.

3. The entry N/A indicates that communication under the given heading is not possible for that station owing to the configuration of the table of organization. For example, no station at the C stratum can employ downward palmar rays or fans, which by definition require that there be two lower hierarchical levels below the initiating station. C_5 cannot communicate downward by the dendrite, since that station has no immediate direct subordinate according to the table of organization.

Table 1

Networks of Communications Transmitted by Stations

Station		Channel Percentages							
		Dendritic		Palmar		Reticuld		Horizontal Within Gp.	Horizontal Among Gps.
	N	Up	Down	Up	Down	Up	Down		
A	25	N/A	68	N/A	32	N/A	N/A	N/A	N/A
B_1	92	2	44	N/A	40	N/A	0	13	N/A
B_2	44	5	31	N/A	N/A	N/A	55	9	N/A
C_1	50	4	48	0	N/A	0	28	20	N/A
C_2	35	14	17	0	N/A	17	40	11	N/A
C_3	34	15	29	3	N/A	9	32	12	N/A
C_4	16	19	37	0	N/A	0	12	31	N/A
C_5	19	5	N/A	0	N/A	16	42	37	N/A
D_1	16	6	N/A	0	N/A	0	N/A	94	0
D_2	25	4	N/A	0	N/A	4	N/A	68	24
D_3	31	13	N/A	0	N/A	0	N/A	65	23
D_4	32	31	N/A	3	N/A	0	N/A	34	31
D_5	12	17	N/A	0	N/A	0	N/A	33	50
D_6	5	20	N/A	0	N/A	0	N/A	80	0
D_7	14	0	N/A	14	N/A	0	N/A	86	0
D_8	15	0	N/A	13	N/A	40	N/A	0	47
D_9	19	42	N/A	11	N/A	21	N/A	0	37
D_{10}	43	0	N/A	0	N/A	18	N/A	0	81
D_{11}	10	40	N/A	40	N/A	0	N/A	20	0
D_{12}	26	15	N/A	0	N/A	23	N/A	27	35
D_{13}	23	22	N/A	9	N/A	30	N/A	N/A	39
D_{14}	30	20	N/A	0	N/A	33	N/A	N/A	47

Since the data were collected by sociometric type questions, no information as to the content of messages was gathered. This lack severely limited the deductions and hypotheses which might otherwise be made. For example, from Figure 22 the statement can be made that A communicated through the dendrite with B_1 on seventeen occasions from a total of twenty-five communications. Since the theory has been advanced that the dendrite is perhaps strongly suited to purposes of centralized decision making, the argument might be proposed that A in relation to B_1 is strongly directive. Without evidence that communications from A to B_1 are in fact couched in terms of orders or instructions, the argument is impossible of proof from the data.

Again, Table 1 indicates that B_2 communicated with C_1,C_3, and C_5 with some frequency. These latter stations are, according to the table of organization, the responsibility of B_1. This circumstance might be taken as evidence of interference by B_2 in the affairs of B_1, and of strong possibilities of confusion among the stations of the C stratum, in that they are apparently receiving communications, perhaps contradictory in intent, from two superiors. This state of affairs is deprecated by both Fayol and Barnard. Yet since B_1 and B_2 communicate with each other on several occasions, it might be that permission has been sought and given for B_2 to communicate with C_1,C_2, and C_3 directly.

If B_2 has addressed C_1 in these terms, "Stop work on this project for B_1, and begin work on this material," then confusion might well result. If, on the other hand, B_2 addressed C_1 in these terms, "I have spoken to B_1 and he has agreed that, after you have completed your current work for him, you are to undertake work on this material for me," then another state of affairs, not subversive of the chain of command, will exist. Without data as to communication sequence and content between stations, deductions as to network usage must remain speculative and tentative.

Furthermore, since data were collected on two days only, inferences made from the fact that stations communicated or did not communicate during the data collection period must be made with caution. For example, in the given period, A did not originate any communication with B_2, but inferences made from this circumstance must be tempered with the realization that if the data had been collected over a longer period, the evidence might be otherwise than was recorded.

With due regard to these limitations, analysis is reported of the communication networks employed by individual stations, and then of various aspects of the networks employed in the whole organization. Networks are mapped over the base provided by the Table of Organization from data presented in Table 1 and Figure 22.

Communication networks employed by A. When communications originating with A were mapped over the Table of Organization, the results were as depicted in Figure 23.

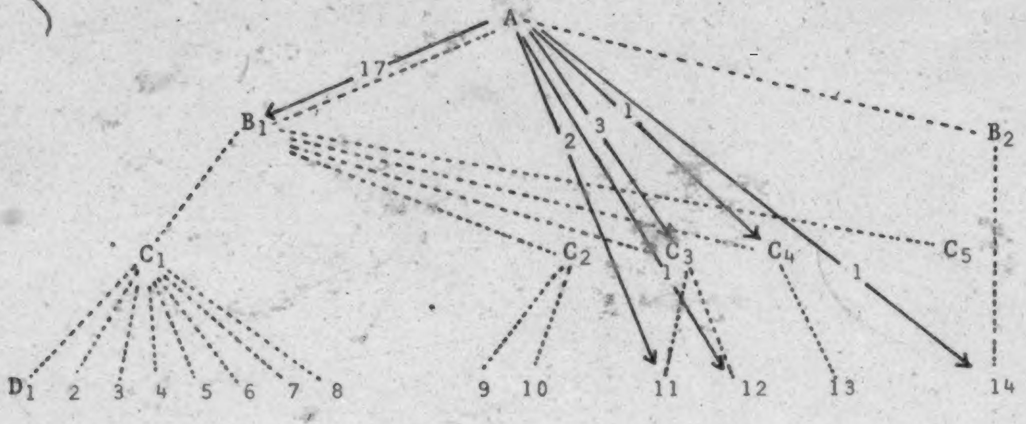


Figure 23

Communication Networks Employed by A

A's communications were relatively few, comprising twenty-five communications of the Departmental total of six hundred and sixteen, but there are other stations on the B stratum which are not in the Communications Department. Of these twenty-five communications, sixty-eight per cent were dendritic to B_1, and thirty-two per cent were palmar, being equally divided between stations on the C and D strata. That is, almost one third of A's communications did not coincide with the channels of responsibility indicated in the Table of Organization. This circumstance might be considered as a source of confusion in that C_3, C_4, D_{11}, D_{12}, and D_{14} receive communications which did not pass through their immediate hierarchical superiors, or it may be regarded as evidence of flexibility in that A approached stations direct without over-scrupulous regard to the niceties of bureaucratic organization. Without evidence as to content of communications to the various stations, or as to the reactions which such communication patterns provoke in the various superordinate stations, such judgments must be held in abeyance.

Concerning the breadth and depth of A's communication in the Department of Communications, consideration of Figure 23 shows that

a) Communication to the B stratum involved 68 per cent of A's total communications and reached 50 per cent of stations on that stratum.

b) Communication to the C stratum involved 16 per cent of A's total communication, and reached 40 per cent of stations on that stratum.

c) Communication to the D stratum involved 16 per cent of A's total communication, and reached 14 per cent of stations on that stratum.

Concerning the communication of A, the following questions may be posed:

1. What was the nature of the duties of B_2, that A did not communicate with that station, though sixty-eight per cent of A's communication is directed to B_1, on the same level?

2. Why did A communicate as frequently with stations on the D stratum as with stations on the C stratum?

3. Why were B_1,C_3, and C_5 by-passed by A? Was this circumstance due to the physical location of work stations, to pressing needs for

rapid action, to the personality and preferences of A, or to other cause?

These questions can not be answered without additional data.

Communication networks employed by B_1. Mapping the communications employed by B_1 over the Table of Organization results in the networks illustrated in Figure 24.

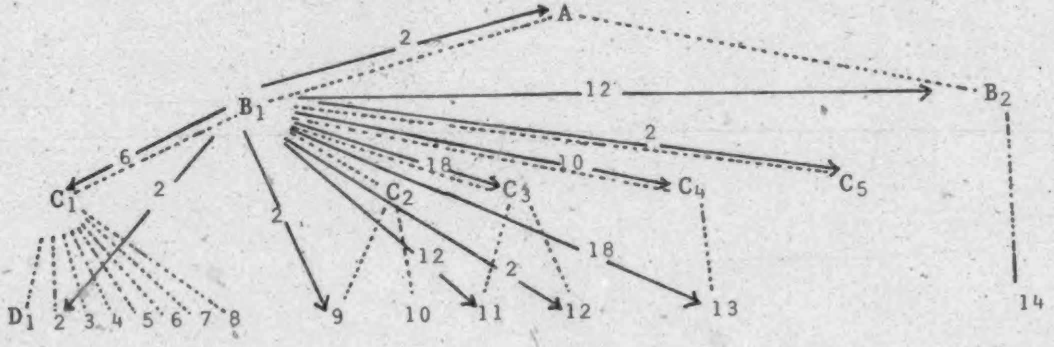


Figure 24

Communication Networks Employed by B_1

B_1 communicated more frequently, on ninety-two occasions, than did any other station. Of these communications, two were directed to A, and the inference seems reasonable that B_1 can operate rather independently of A, at least in the sense that frequent upward dendritic reference seems unnecessary. Yet this statement must be made with caution. The two communications to A might have been so comprehensive that they might contain all necessary information. Again, A's seventeen communications with B_1 might have been so comprehensive that B_1 need only carry out directives without further questioning or reporting back.

Thirteen per cent of B_1's communications were with B_2, which might imply some interdependence with that station. The remaining communications comprised forty-four per cent dendritic communications through the "proper" channels of responsibility, and forty per cent palmar communication to stations on the D stratum compatible with the dendrite headed by B_1. There was no downward reticulated communication to the only possible recipient, B_{14}. The implication might be that B_1 tends to communicate predominantly within his own departmental area, but that he by-passes the chain of command almost as frequently as he adheres to it. Whether this is to be regarded as evidence of potential confusion or of ready flexibility is again an open question.

Concerning the breadth and depth of B_1's communications, consideration of Figure 24 shows that:

1. Communication to the A stratum involved 2 per cent of B_1's total communication. A is the sole station at that level.

2. Communication with the other station on the B stratum level involved thirteen per cent of B_1's total communication.

3. Communication with the C stratum involved forty-four per cent of B_1's total communication and reached sixty per cent of stations on that stratum.

4. Communication to the B stratum involved thirty-six per cent of B_1's total communication and reached twenty-one per cent of stations on that stratum.

5. B_1 did not communicate with other than the head of the other "department," that is, he employed no downward reticulation.

Many of the questions which were posed concerning the communications of A are applicable to those of B_1.

1. Why did B_1 communicate with the D stratum stations almost as frequently as he did with the C stratum?

2. Why did B_1 communicate on eighteen occasions with D_{13} and only ten times with D_{13}'s superior, C_4?

Answers to these questions cannot be provided from the data so far available.

Communication networks employed by B_2. Mapping the communications of B_2 over the Table of Organization produced the networks depicted in Figure 25.

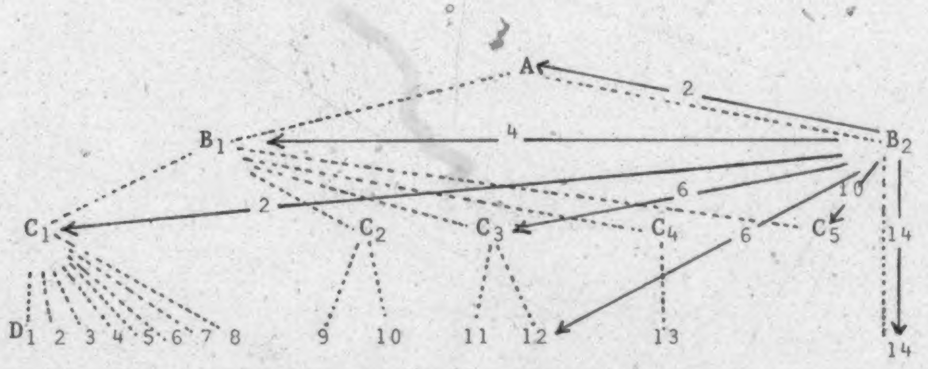


Figure 25

Communication Networks Employed by B_2

B_2 communicated less than half as frequently as B_1. Of forty-four communications, forty-five per cent were directed to stations which were properly within the responsibility of B_2 as laid out in the Table of Organization, inclusive of thirty-one per cent dendritic to the single hierarchical subordinate, D_{14}, nine per cent horizontal to B_1, and five per cent upward dendritic to A.

In contrast, B_1 communicated on eighty-four per cent of occasions within his dendrite as opposed to thirty-one per cent as reported by B_2. Fifty-five per cent of B_2's total communications were with stations properly within the responsibility of B_1. Figures 24 and 25 tend to indicate that B_2 operated a section of the Communications Department which was independent of B_2, while B_2 operated a section which was intimately connected by communication with B_1's subordinates, for whom B_2 had no responsibility according to the Table of Organization. Whether this circumstance is indicative of a state of confusion or of harmonious co-operation cannot be established from the data available.

Concerning the breadth and depth of B_2's communications, consideration of Figure 25 indicates that:

1. Communication to the A stratum involved five per cent of B_2's total communication. A is the sole station at that level.

2. Communication with B_1, the only other station on the B stratum level, involved nine per cent of B_2's total communication.

3. Communication to the C stratum involved forty-one per cent of B_2's total communication and reached sixty per cent of stations on that level.

4. Communication to the D stratum involved forty-five per cent of B_2's total communication and reached fourteen per cent of stations on that level.

The following questions might be posed concerning the communications of B_2:

1. What were the duties of C_5, that B_2 communicated five times more frequently with that station than did B_1, within whose chain of command C_2 properly belongs?

2. Did the preponderance of reticulated communication by B_2 to the direct subordinates of B_1 cause any resentment or confusion in the minds or in the operations of B_1's subordinates?

These questions may not be answered from the available data.

Dendritic patterns in the total Communications Department. Since this chapter is not directed to the study of all communication patterns employed by all the stations of the Communications Department, no attempt is made to consider individual patterns of communication of stations on the C and D strata. Instead attention is directed to the total patterns developed in the whole organization.

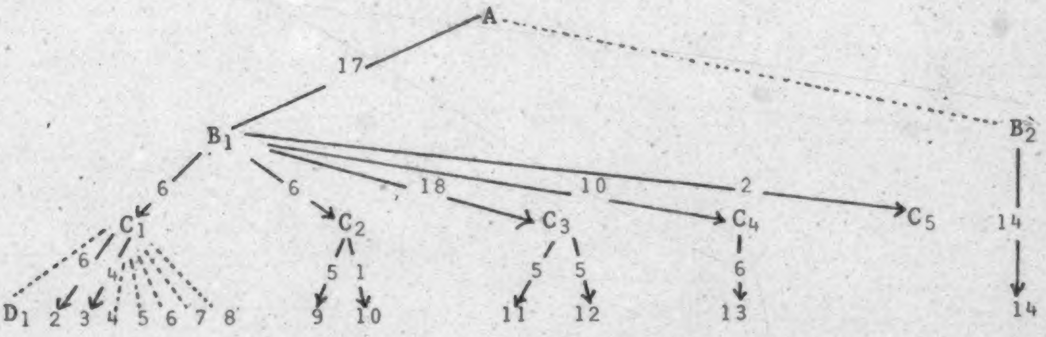


Figure 26

Downward Dendritic Networks

The downward dendritic network evidently exists and is well developed, except in A's communication with B_2 and in the section headed by C_1. However, this network only carries seventeen per cent of the total communication of the department. If the assumption is made that any one communication was neither more nor less important than any other, then the tentative hypothesis can be made that the dendrite is not the major network system.

The other dendritic system is that which is directed upward from the subordinate to the immediate superordinate.

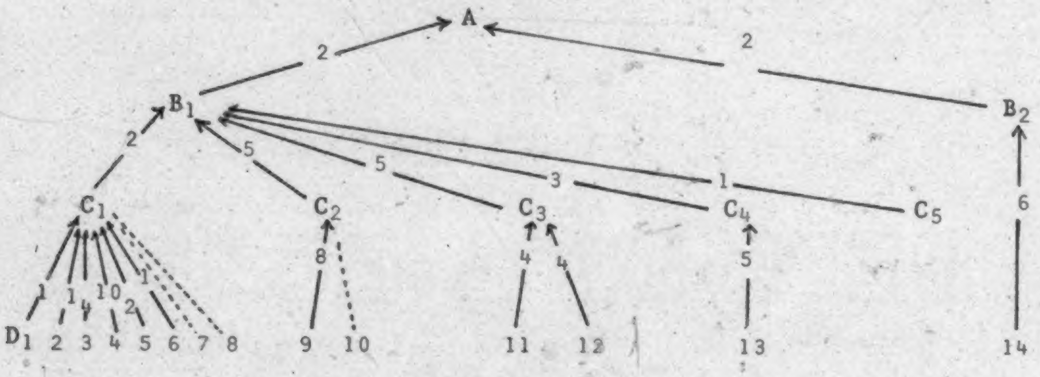


Figure 27

Upward Dendritic Networks

The upward dendritic network exists in a well developed form and is complete excepting the D_7, D_8 to C_1 and D_{10} to C_2 elements. The network carried less than eleven per cent of the total communication of the department, so that all dendritic communication, both upward and downward, comprised some twenty-eight per cent of the departmental total.

Palmar patterns in the total Communications Department.

Downward palmar patterns, by definition, are communications from a superordinate to a subordinate who is at least one stratum removed from the superior. Thus, from the Table of Organization, no station on the C or D strata, nor B_1 may employ this network; while, conversely, A, B_1 and B_2 may not employ upward palmar patterns. D_{14}, the only subordinate of B_2, may only have palmar communication with A. The downward palmar networks are illustrated in Figure 28.

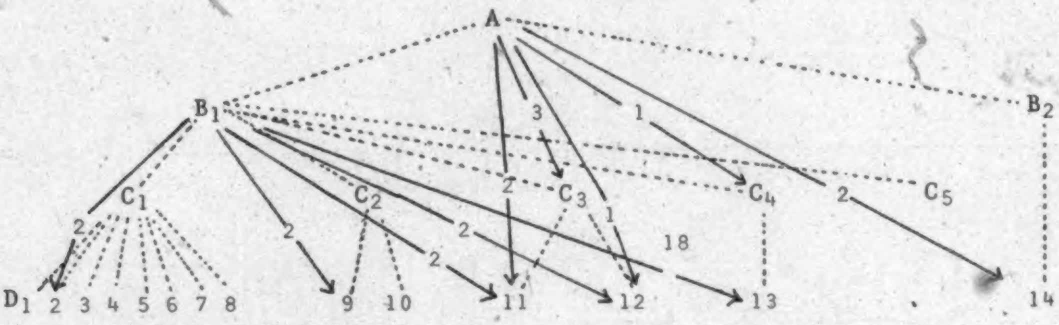


Figure 28

Downward Palmar Networks

The downward palmar network is not well developed, in that as employed by A, it reached five of a possible nineteen stations, and as employed by B_1, reached five of a possible thirteen stations. The network carried slightly under six per cent of the total departmental communication. The hypothesis might be advanced that the downward palmar network is an auxiliary system.

The upward palmar system is illustrated in Figure 29.

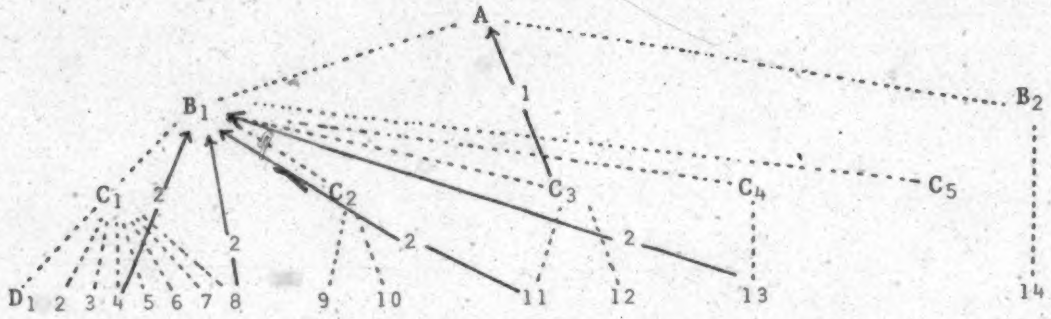


Figure 29

Upward Palmar Networks

The upward palmar network is poorly developed in that only five of possible nineteen channels were involved. Slightly over one per cent of the whole departmental communications were carried on this network.

Reticulated patterns in the Communications Department. Reticulated networks are defined as those which are transmitted between a subordinate and a superordinate other than one who occupies a direct relationship to the subordinate in the Table of Organization. Thus communication from D_9 to C_1, or from C_3 to B_2 is reticulated. A cannot employ this network since he occupies the apex of all sub-dendrites and is thus always communicating within the bounds of responsibilities of the Table of Organization even when he omits stations on various strata.

The downward reticulated network is illustrated in Figure 30.

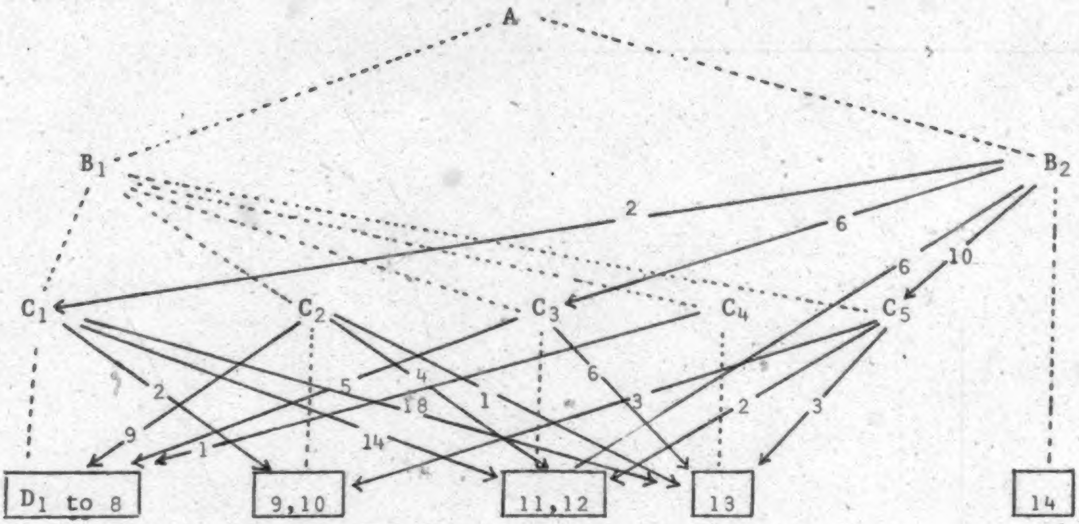


Figure 30

Downward Reticulated Networks

This network is diagrammed so that individual stations on the D stratum were consolidated into sub-departments in the interest of clarity. Reticulations can exist between the D and B strata, the D and C strata, and the B and C strata. Of thirty available channels, fifteen were in use. Of nine reticulated channels available to B_2, four were used. Slightly less than sixteen per cent of the total communications were carried by downward reticulated networks.

The upward reticulation networks are illustrated in Figure 31.

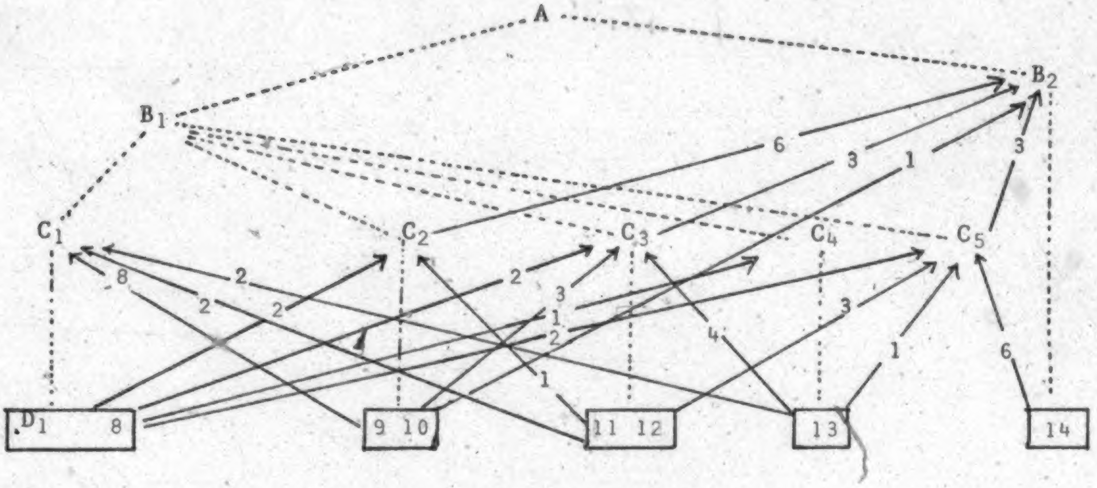


Figure 31

Upward Reticulated Networks

In theory there are thirty channels of reticulation available, as was the case with downward reticulations. Of these potential channels, eighteen were in use, and carried slightly less than nine percent of the total communication. The network may then be considered to be well developed. Jointly the reticulations carried slightly less than one quarter of all the communications of the department.

Horizontal patterns in the Total Communications Department. A distinction has been drawn previously between horizontal communications among and within groups. In this context a group is defined as being a number of stations on the same stratum which have a common immediate hierarchical superior. Thus B_1 and B_2

are a group, while D_9 and D_{11} are not. Horizontal communications are illustrated by means of circular figures in Figure 32. Since the B stations and the C stations each comprise one group on their own hierarchical level, there can be no "between group" communication involving B or C stations.

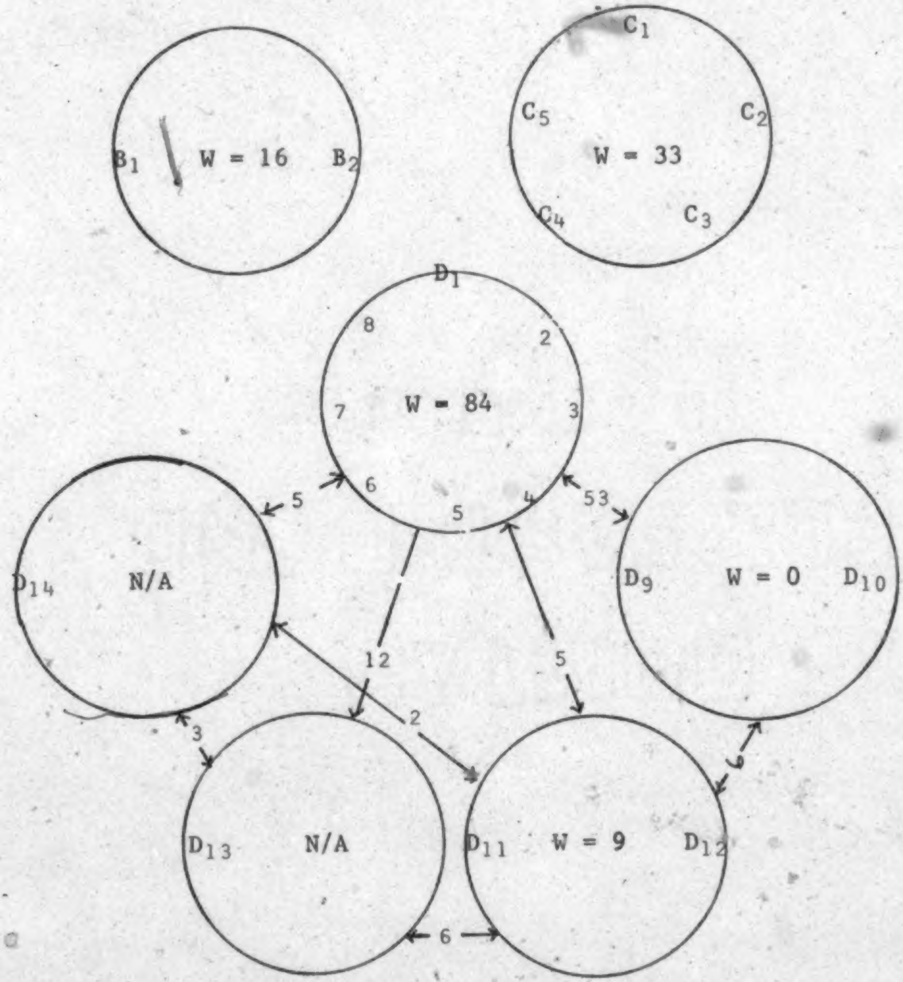

B1
W = 16
B2
C1
C2
C3
C4
C5
W = 33
D1
8
2
7
W = 84
3
6
5
4
5
53
D14
N/A
D9
W = 0
D10
12
5
2
3
6
D13
N/A
D11
W = 9
D12
6

Figure 32

Horizontal Communication Within and Among Groups

Horizontal communication is only possible, among groups, at the level of the D stratum. Here, with ten available channels, eight were in use, if the assumption is made that a channel has two-way capacity. The horizontal communication system must then be considered eighty per cent complete as far as channel usage is concerned. The total among-group communication involved slightly less than fifteen per cent of the total communication. Within-group communication involved slightly less than twenty-three per cent of total communications. The percentage of all communication carried by horizontal channels was slightly less than thirty-eight per cent.

Summary of Total Departmental Patterns

From the examination of the various communication networks employed, certain conclusions may be advanced for the Communications Department:

1. Horizontal networks carried thirty-eight per cent of all communications. Eighty per cent of available channels were used, though a large variation in load on channels was shown within and among groups.

2. Dendritic networks carried twenty-eight per cent of all communications. Ninety-five per cent of available channels were used, and hence the system must be regarded as well developed.

3. Reticulated networks carried twenty-five per cent of all communications. Fifty per cent of the available downward

reticulated channels were used, compared with fifty-seven per cent of the available upward reticulated channels.

4. Palmar networks carried seven per cent of the total communications and thirty per cent of available channels were used.

Speculation as to causes and effects in these networks was hampered by lack of available information. Sociometric-type questions do not reveal, for example, whether B_1 communicated with D_8 because A communicated previously with B_1, whether C_3 communicated with A (Figure 28) in response to a message thrice repeated from A (Figure 29) or on a matter totally unrelated to communications from A.

The Table of Organization of the Communications Department appears to be largely irrelevant to the channels by which communications actually flow. Only twenty-eight per cent of the total communications adhered to the strict demarcations of responsibility, as indicated by the dendritic network. Even if palmar networks are regarded as an aberrent form of the dendrite, the addition of seven per cent to the original twenty-eight still leaves almost two-thirds of all communications carried by channels which are "informal" as defined by certain authors.

Melcher and Beller (1967:41) regard formal channels as those which coincide with the formal chain of command, and Kelly (1969:461) considers that the "organizational structure may be thought of as synonymous with the communications net." These viewpoints appear open to redefinition in the circumstances which have been reported here, unless demonstration can be made that communications which are considered to be formal have some quality which is different from that found in non-formal or informal communication apart from the channel selections involved. Perhaps a more useful definition might be made in these terms: "Formal communications are those which are conducted overtly in an organization and which are directed toward the furtherance of the aims of the organization, and with the approval of management." Such a definition would appear to legitimize reticulated and horizontal communication in a way which appears excluded by the statements of Melcher and Beller, and Kelly.

Concluding Remarks on Mesh Analysis Technique

In this chapter an examination has been made of the communication patterns and networks of an organization operating in 1972, and a demonstration made that dendritic, palmar, reticulated, and horizontal communication networks as postulated exist and provide a basis on which organizational communication can be analyzed. However, the sociometric-type questions which supplied the original data base provided only information concerning who originated communication of a work-oriented nature, to whom it was transmitted, and with what frequency. While this data base was adequate to establish the various proportions of communications carried by the basic networks (dendritic, palmar, reticulated, and horizontal) both for individuals and for the organization as a whole, it was inadequate to demonstrate the existence of the variations of these basic patterns. Identification of contracted dendrites, defined as an identical message sent to all staff simultaneously, as by a public address system or by a circular notice, depends on knowledge of sequences, and content of communications which cannot be detected by the aggregative technique of sociometric-type data-gathering questions.

This same limitation applies to such other variations on the basic patterns as the full or partial palmar fan, feed-on, feed-through, and feed-back modes. Contoured horizontal systems, with synclinal and anticlinal systems might require for their detection and evaluation forms of interaction analysis quite apart from the collection of data on content, sequence, and destination of individual messages.

A complete investigation of communication networks in an organization would thus require the collection of a formidable mass of data which would be difficult to acquire and tedious to analyze, except over a very limited period. Such data do not appear to be available in respect of any one organization. Data which have been collected by investigators are, in general, aggregated for various purposes of analysis, and are difficult to reconstruct for analysis in another conceptual framework. For example, the original data collected by Simpson (1959) were aggregated for analysis in terms of horizontal and vertical components of communication, and may not be used for analysis in terms of dendrites and reticulations. The literature on administrative and organizational communication which gives adequate data as to who said what, to whom, by what channels, for what reason, in what sequence, and for what result, appears to be extremely rare.

Consideration of these limitations, together with those of time and space, tends to lead to the conclusion that mesh analysis might best be directed to the examination of crucial incidents for which data might be reasonably sought, or to the examination of communication patterns employed by selected key personnel in formal organization.

Chapter 6

COMMUNICATIONS OF A SUPERORDINATE

This chapter concerns the investigation, in the field, of the communications of a superordinate in a large urban school district. The purpose of this investigation was to attempt, from data gathered on the superintendent's choice of networks, his frequency of usage of these networks, and by analysis of his messages in terms of subject content and of mood of issuance, to make some inferences as to the administrative communication "modes" of this superordinate. However, the main thrust of the investigation was predominately concerned with the demonstration of a technique rather than with the development of a theory of such "modes," since only one superordinate was involved and no comparison with other or similar figures was made.

The superintendent agreed to make available all correspondence sent out over his signature or by his direction for the period of one school year. This correspondence was classified by reference to the network typology presented in this thesis and also coded in terms of content. Analysis of these data was then made to detect the elements of the communication "modes" of this executive.

Description of the Educational System

The system in which the superintendent was employed was a large urban school district, employing over one thousand teachers and catering to over thirty thousand students. The superintendent was designated as the chief executive officer of the system, and reported to an elected board of trustees. The central office staff is comprised of some sixty members. The Table of Organization is illustrated in Figure 33.

This figure is somewhat simplified so as to be more readily comprehensible. The chain of responsibility is complete to the D stratum level. At the E stratum level there is a small number of directors of small sub-systems who have headship over one other subordinate. This is not represented in the diagram in that the location of an F stratum would complicate the figure more than appeared warranted by the inclusion. At the levels below the E stratum, numbers proliferate so that individual representation was difficult.

The allocation of letters and sub-scripts is as follows:

1. All strata are counted from the apex downward. Thus two strata intervene between A and D_5. There is no connotation because two stations have the same assigned letter that they have equal status in terms other than by the number of strata intervening between the stations and the apex, A. Thus a D station is subordinate to a C station, but not to all C stations.

2. A is the superintendent.

3. B_1 is the secretary-treasurer, heading a department comprising Payroll (C_1), Assessment (C_2), Budget-purchasing (C_3), and Data-processing (C_4).

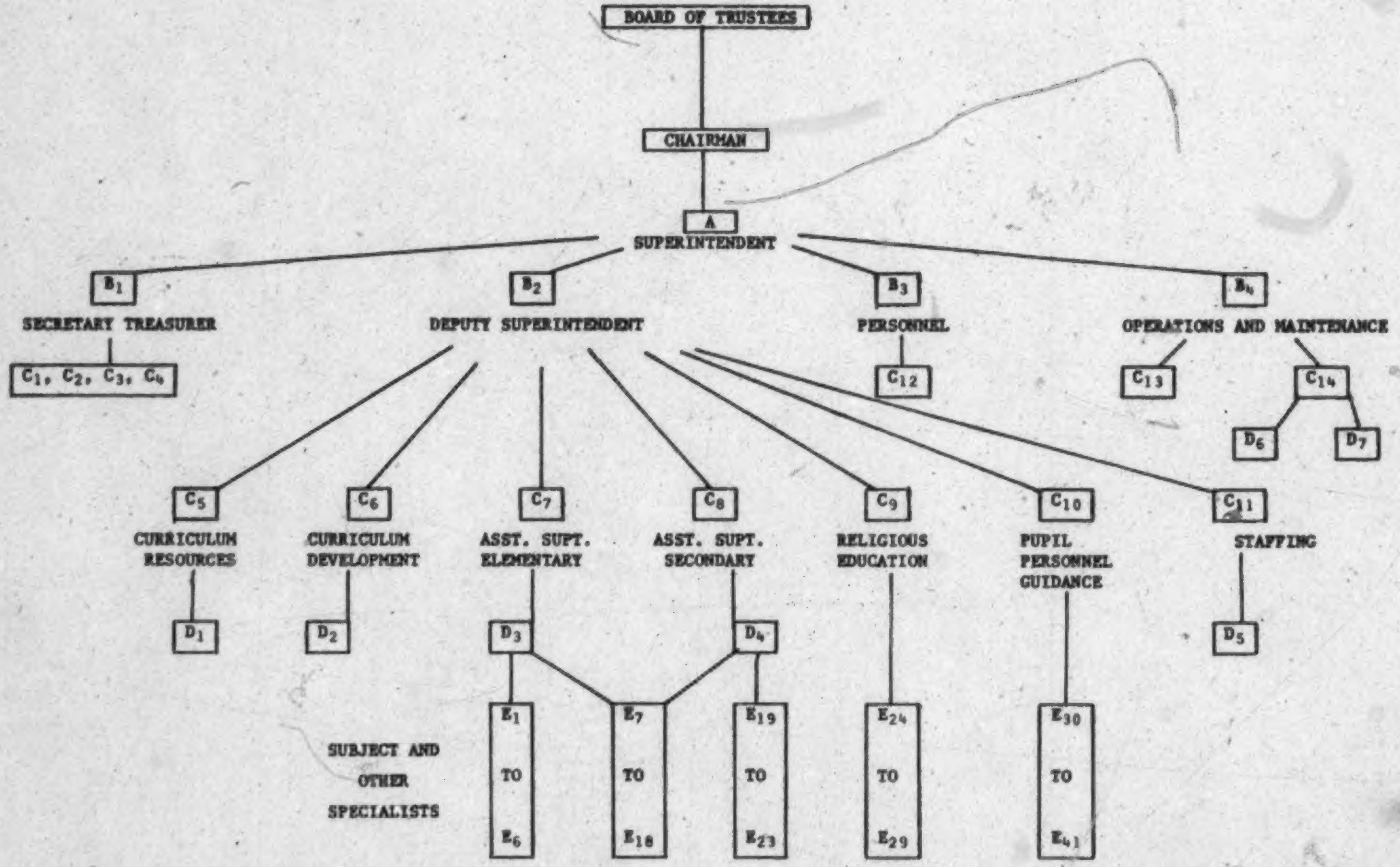

BOARD OF TRUSTEES
CHAIRMAN
A
SUPERINTENDENT
B_1
SECRETARY TREASURER
C_1, C_2, C_3, C_4
B_2
DEPUTY SUPERINTENDENT
B_3
PERSONNEL
C_{12}
B_4
OPERATIONS AND MAINTENANCE
C_{13}
C_{14}
D_6
D_7
C_5
CURRICULUM RESOURCES
D_1
C_6
CURRICULUM DEVELOPMENT
D_2
C_7
ASST. SUPT. ELEMENTARY
D_3
C_8
ASST. SUPT. SECONDARY
D_4
C_9
RELIGIOUS EDUCATION
C_{10}
PUPIL PERSONNEL GUIDANCE
C_{11}
STAFFING
D_5
SUBJECT AND OTHER SPECIALISTS
E_1 TO E_6
E_7 TO E_{18}
E_{19} TO E_{23}
E_{24} TO E_{29}
E_{30} TO E_{41}

Figure 33

The Table of Organization, Central Office

4. B_2 is the deputy superintendent, heading the instructional program, with responsibility for seven department heads: Curriculum Resources (C_5), Curriculum Development (C_6), Assistant superintendent (Elementary) (C_7), Assistant superintendent (Secondary) (C_8), Religious Education (C_9), Pupil Personnel and Counselling (C_{10}), and Staffing (C_{11}).

5. B_3 is head of Personnel, with one assistant, C_{12}.

6. B_4 is head of Operations and Maintenance with two subordinates, Caretaking (C_{13}), and Warehousing (C_{14}).

7. C_5, head of Curriculum Resources, had one subordinate, D_1.

8. C_6, head of Curriculum Development, had one subordinate, D_2.

9. C_7, Elementary Assistant Superintendent with direct responsibility for elementary schools, was assisted by a Director (D_3) and by six subject specialists, E_1 through E_6, and shared other such specialists (E_7 through E_{18}) with the Secondary Assistant Superintendent.

10. C_8, Secondary Assistant Superintendent, had direct responsibility for secondary schools above grade six, was assisted by a Director (D_4), and while sharing the subject specialists E_7 through E_{18} with C_7, was alone responsible for the subject specialists E_{19} through E_{23}.

11. C_9, head of Religious Education, had six subordinates, E_{24} through E_{29}.

12. C_{10}, head of Pupil Personnel and Counselling, had twelve subordinates, E_{30} through E_{41}.

13. C_{11}, head of Staffing, had one subordinate, D_5.

Data Collection

The correspondence of the superintendent took three forms:

1. *School Bulletins*, for the period September 1, 1971 to August 31, 1972. While the superintendent did not personally write all materials in the Bulletins, none was sent out without his approval. Since the actual authorship was in doubt, these materials were analyzed, but treated separately from those materials personally composed by the superintendent.

2. *Personal Correspondence*, dictated and signed by the superintendent and filed in carbon copy form. This material was available in a chronological file. Letters which were of the form "To whom it may concern," were omitted from the analysis as they could not be coded without an addressee, as were letters dispatched by the superintendent in capacities other than his official position in the school district, as, for example, when a letter was sent from him in his capacity as a member of a charitable organization.

3. Another class of communication was in the form of memoranda for which no carbon copies were maintained on file, and which were primarily addressed to members of the central office staff. The numbers of such staff, together with the number of files which each such staff officer maintained, made search for such memoranda impracticable. However, the superintendent's stenographer had retained all shorthand notebooks used in the period under examination,

and translated their content to recorder tapes which were then analyzed.

The assumption was made in this case that all messages so recorded were in fact dispatched as recorded.

An assurance was given to the author that these materials included all communications made in writing (typescript) by the superintendent in the given period.

Message Analysis and Coding

In organizations thus far considered, whether imagined or actual, all communication has been internally directed and hence could be classified as to channels by the methods described. In the case of the superintendent, much correspondence was directed outside the system, and hence could not be classified by these means. The exterior environment of this educational system was classified as indicated below.

1. The Department of Education and its staff was termed the "Provincial Supra-system."

2. The Federal government and its agencies was termed the "Federal supra-system."

3. Private commercial companies, other educational jurisdictions, social, cultural, religious organizations, other governmental agencies, whether municipal or provincial, were termed "other systems."

4. Adults, if communicated with as parents were so termed; but in a non-parental capacity were termed "citizenry."

5. The Board of Trustees and its Chairman were designated as such.

Message Content Coding

The analysis of message content coding was based first in terms of subject content, and second, in terms of mood of issuance. In the sense that "mood" is used here, the word is not exclusively grammatical as in "imperative mood." The following imaginary messages illustrate the concept of "mood."

1. "The daily attendance rate in your school is much below that which is acceptable. You will therefore have to take some remedial action."

2. "The daily attendance rate in your school is much below that which is acceptable. What are you going to do about it?"

3. "The attendance rate in your school is much below that which is acceptable. I invite proposals for my consideration on how this matter might be remedied."

4. "Have you considered your daily attendance rate in comparison with those of other schools recently?"

The content of all four messages is almost constant. The first three messages are concerned with (a) poor attendance rates, and (b) some remedial action. The fourth message conveys the same content by implication. Yet the four messages are different in mood. The first states a fact, and *orders* action without exact specification. The second states a fact and *questions* if action will be taken. The third states a fact and *invites* proposals. The fourth merely asks a *question*. Consideration of such similar communications led to the recognition that content analysis must incorporate two dimensions, one on subject matter, and another on what was termed the "mood." A category scheme was then devised to incorporate twenty-two classes of subject matter which appeared *a priori* to be appropriate to the communication of a school system superintendent and ten categories of "mood," later contracted to eight.

The subject categories were as follows:

No. 1	Educational Staff	This item refers to all personnel in the system whose employment requires that they possess a teaching certificate of the Province of Alberta, or to persons who apply for positions which require such a certificate.
No. 2	Non-educational staff	This item refers to all other employees in the system who are not required to possess a teacher's certificate as a condition of employment.
No. 3	Pupils	This item refers to any student enrolled in the system or who anticipates such enrolment, or who has lately been so enrolled.
No. 4	Parents	This item refers to any adult, whether parent or guardian or other relative who is responsible for a pupil or pupils as defined above, and who is referred to in that capacity.
No. 5	Board, personnel and operations	This item refers to the elected Trustees of the Board, and to their specific actions as a Board. It does not refer to the area of responsibility of the Board.

The above five items concern personnel, but refer only to content of communication, not to addressees. A communication to a teacher would recognize the addressee in the network code, but not as a content item, as would be the case if the communication were about a teacher rather than to one.

No. 6	Fixed Property	This item refers to land and buildings of any kind in which the personnel of the system have an interest in their official capacities.
No. 7	Supplies, educational	This item refers to materials purchased or acquired officially for the instruction of pupils and which are either consumed in use, as with pencils and crayons, which are replaced rather than repaired, as with library books, and which have a relatively short life and low cost, not usually exceeding about fifteen dollars. A precise definition is difficult.
No. 8	Supplies, non-educational	This item refers to materials of the general usage, cost and "life" indicated above, but which are not used normally in the direct instructional process. Materials such as paint, toilet paper, fuels, oils, greases, mops, tyres, stenographic supplies used outside the schools, would be typical of this classification.
No. 9	Equipment, educational	This item refers to materials used in the instructional process which are generally permanent, made up of parts, sent for repair rather than discarded when worn, usually expensive, and having a life measured in years. Materials such as tape recorders, radios, televisions, tables, and film projectors would be typical of this classification.
No. 10	Equipment, non-educational	This item refers to materials of the general description given above, but which are not used in the instructional process. Materials such as buses, vacuum cleaners, office duplicating materials, and paint sprayers would be typical of this classification.

No. 11	Budgetary ($)	This item refers to any expense or income disbursed or received by the school system personnel, or which might be so in the future, but which is not related to either supplies or equipment as defined above. Thus salaries, bursaries, over-time payments, prizes, and awards which will be or have been paid for by system funds, together with the budget statement itself, would be typical of this classification.
No. 12	Education, process and purpose	This item refers to all mention of the purposes and techniques of education in this school system or any other, to both formal and informal education, to pre-school and post-secondary education. It includes both education as a practice and as a philosophy.
No. 13	Discipline	This item refers to standards of behavior and morale of students and staff, to methods of maintaining and improvement of this ideal, and to both actual cases and to the abstract concept of discipline.
No. 14	Health and safety	This item refers to the physical condition of students, staff, and to health hazards which might affect the well-being of such persons, drug abuse, head lice, alcoholism, and road safety patrols would be typical of this classification.
No. 15	Professional educational organizations	This item refers to permanent organizations whose membership is restricted to persons who hold or who have held a teaching certificate from a recognized teaching authority. Membership must not be restricted to one school system. Thus a principals' meeting in one school district would not be included under this heading, but a provincial council of school administrators would qualify.
No. 16	Non-educational organizations	This item refers to organizations, whether temporary or permanent, whose membership is not restricted to those holding teachers' certificates. Thus Chambers of Commerce,

		Medical Associations, Parent-teacher organizations, the Canadian Legion, and ethnic and cultural groups would be included in this classification.
No. 17	Social recreational	This item refers to leisure pursuits of students, adults, or general society, which are attended or engaged in by choice. Thus a school recess would not be classed under this heading, but voluntary play after school would be.
No. 18	Transport, vehicles and trips	This item refers to any journey or visit made by, or proposed by, any person or persons with the permission or knowledge of the system jurisdiction. The classification includes the vehicles of such journeys.
No. 19	Religious	This item refers to any person whose relationship to the system is of a religious context, to courses of religious study, and to various religious ceremonies and practices.
No. 20	Promotion, dismissal, transfers, and absences	This item refers to any actions affecting any person who is promoted, dismissed, transferred, given leave, or who is absent, and to the hiring of persons to fill such positions as may be vacated or otherwise created.
No. 21	Policies, regulations forms, reports	This item refers to official records and returns, to rules and policies which guide the conduct or report the conditions of the system's functions. The item includes official courses of study, and special reports of an emergent nature and of an official status.
No. 22	Testing, guidance, evaluation	This item refers to the testing of students, to guidance activities in schools, to teacher evaluation, and to any other measures of performance of personnel. The item will not thus include soil testing for building purposes.

No. 22, 23	Other	These two items were left vacant to cater to other classes of subject content which might emerge during the analysis of communication, but which did not occur with a sufficient frequency to warrant the addition of a specific additional item. Examples of typical items include publicity, car plug-ins, lost property, postal codes, Parliamentary Rules of Order, conservation, bequests, hours of work, community use of schools, and the like. On occasion these items were used to further clarify and particularize other items, as environmental education might be coded under Education, Process and Purpose, and also under Environment (Other).

The range and variety of subject matter was found to be so large that an arbitrary choice had to be made of item headings. Such a choice was made as attempted to avoid both the danger of making item headings few and all-embracing to the point where the coding might not serve to distinguish between various contents, and on the other hand the danger of excessive sub-division to the point where aggregation was impeded.

The mood categories were first established as follows:

A.	Gives orders	This item refers to a requirement that some person take some action without the possibility of the exercise of discretion, or evasion of action.
B.	Invites orders	This item refers to the request by a person for orders as defined above to guide action in a state of uncertainty.

Both Items A and B as defined above were included in the first draft of the coding sheet, but were omitted after it was found almost impossible to distinguish between the "Order" items and the "Instruction" items. New items A and B were then devised, and the second draft included mood categories as follows:

A.	Gives instructions	This item requires that some person or persons take action which might be specific or general, which tends to indicate a desired result, but which may or may not specify the means. This category includes conditional instructions of the type "Interested teachers should contact the central office" since although there is a possibility that no teacher is so interested, those who do fall within this condition are instructed as to what action should be taken.
B.	Invites instructions	This item refers to communication in which a person invites instructions as defined above. This might typically occur in a situation where responsibilities are ill-defined and yet where action by a subordinate might establish a precedent which might commit other and future events to a given pattern.
C.	Gives suggestions, advice, proposals	This item refers to communications which do not commit the receiver to a definite course of action or indeed to act at all. The difference between item A and item C is not so much in the language employed, as in the clear option to do other than is suggested. For example, a communication of the form "I suggest that you do such-and-such" would be defined as an instruction of type A, while one of the form "In your position I would do this, but the local situation may be such that some other action might be better" would be classed as a suggestion. The option of taking independent action is essential.
D.	Invites suggestion, advice, proposals	This item refers to communications which are tentatively advanced as bases for action in the future but which are not implemented by the receiver as a matter of course, but taken under advisement. A typical communication of this type might be "The system has a problem concerning the abuse of drugs. What suggestions or proposals relating to this issue would you care to make?" As used by a superordinate, the mood would tend to indicate that the resources and

		opinions of subordinates are invited before decisions are made by the superordinates. Conversely, the absence of this form of communication might tend to indicate that such opinions are neither invited nor valued.
E.	Gives explanations, states facts	This item refers to communications which do not require action explicitly and which do not give advice or suggestion, but which present information of a factual nature. Communications of the form "The School Act states in Section 65 . . ." or "The enrollment of students in December, 1972 increased by 10 per cent" or "Friday the 13th. February will be a school holiday." would be properly placed under this head.
F.	Invites explanations, statements of facts	This item refers to communications which invite statements of the type indicated above in E. Typical examples might be of the form of "Please inform me as to why you were absent from school." or "What is the present status of the negotiations for this site."
G.	Gives approval	This item refers to the approval of a course of action taken by another, but not to the commendation of an individual. Thus "I wish to commend the staff of your school for the excellent examination results in Grade XII" is not properly of this type, but rather statement of fact, type E. A communication such as "Your action in closing the school on Friday is commended in view of the failure of the water system" or "Your proposal to institute regular meetings with parents of students who are frequently tardy is approved" are properly included in this category.
H.	Declines to give approval	This item refers to the negation of type G above. Thus, a communication such as "Your application for sabbatical leave is not approved" is considered to be of this type in that a projected plan has to be discarded. A communication of the type "Your present standard of

> teaching is in some respects unsatisfactory" is considered to be a statement of fact in that it refers to the condition of an individual and not to a specific action or proposal.

One additional code indicated whether the communication under examination was a reply to a previously received communication. A "X" was printed on the coding sheet if such was the case.

Single and Multiple Coding

The messages which were analyzed frequently ranged over a wide variety of topics and moods. Since single coding would require decisions as to dominant subject matter and mood, the decision was made to code each subject area and mood on one communication coding-sheet rather than to introduce arbitrary decisions as to dominant or subordinate matters and mood. No subject and mood code was used twice for any one communication.

Definition of a Communication

A communication was defined as a single letter, if in letter form, or as a paragraph or paragraphs included between side-headings in School Bulletins. Where in letter form one message was dispatched to several addresses, this was considered to be one communication, but with multiple delivery which would be indicated by appropriate network coding. Enclosures to other communications were disregarded unless the enclosure was given in full, in which case the whole was regarded as one communication. Carbon copies were considered to be multiple delivery of one message.

Assumptions

The following assumptions were made:

1. The formal, written communications of the Superintendent were typical of all his communications whether written or oral.

2. Each communication represented in the files by carbon copies, or in shorthand notes in the stenographer's notebook was in fact sent as indicated.

3. There existed no other typed or hand-written or shorthand communications which were not made available to the investigator.

Delimitations

The following delimitations were imposed:

1. Only written communications sent, or designed to be sent, from the Superintendent were considered. The fact that the Superintendent conducted much business by telephone and by face-to-face meetings was both recognized by the investigator and emphasized by the Superintendent and by his staff. Some correspondence did in fact refer in writing to conversations held previously.

2. No communications sent by other persons in the name of the Superintendent on occasions when he might be absent were included. That is, the communications of the person in his proper office rather than of persons who might temporarily be placed in that office were accepted.

Limitations

The following limitations were established:

1. The communications analyzed were restricted to the period of one school year, from September 1, 1971 to August 30, 1972.

2. Communications originating with the Superintendent only were analyzed. The communications received by him would have afforded additional insight into communication range and style, but were omitted from consideration.

3. Certain modes of network analysis were not made available by restriction of the data collection to one superordinate figure. Thus reticulations, dendritic communications between stations below the immediate subordinate stratum, and all horizontal communication between equals, or of collegial forms of communication where the superintendent exchanged views with others without conditions of hierarchical dominance being applied, remained unrecorded by the data collection method and by the design of the investigation. The intent was to investigate the communications of one figure rather than to investigate communications of the organization.

Reliability of the Coding Classifications

In order to demonstrate that the coding of content both by subject area and by mood was not an act of arbitary personal interpretation, a tentative matrix sheet was developed but without descriptions of categories; that is, the code was held to be self-explanatory. A sample of thirteen communications from the School Bulletins for September 1st, 1971, and a further seven letters from the correspondence file for the same month, to a total of twenty messages were presented to a graduate student with sufficient copies of the tentative coding matrix. This student was invited to code the messages after a brief description of the various categories was given orally. The coder was invited to describe his thoughts and decisions as he worked, while the investigator noted what differences in perception of categories were demonstrated as work proceeded. When the twenty messages were coded by the volunteer student, the investigator coded the same messages according to his own perceptions and made a comparison. The amount of agreement in coding was so low that the production of an exact percentage was pointless and could not have exceeded twenty per cent. As a result, two mood items were deleted from the matrix as being indistinguishable, and their essential features transferred to another category. In effect, four items of mood were collapsed into two.

The major differences in coding seemed to be related to the following:

1. The original "order" and "instruction" items could not be discriminated from each other.

2. Where the investigator coded for explicit content, the graduate student tended to code also for implicit content. For example, student record cards were coded by him as Board, personnel and operations (5) in that such reports were implicitly a requirement of the Board. He and the investigator agreed in coding them under Pupils (3), and as Policies, regulations, forms and reports (5).

3. That familiarity with coding items which might be

demonstrated by the investigator could not be readily transferred to other coders in a short time.

As a result of this preliminary trial the original coding matrix was expanded to further particularize the subject areas, though the items were not otherwise changed, and a set of definitions of subject and mood items was developed. The investigator then re-coded the original twenty communications on the new matrix sheet and placed them aside.

Two more graduate students were then requested to take part in a new coding of the communications by the new matrix. To avoid errors due to misreading or inattention the coder was given the communications one at a time and a brief oral description of the content and mood items delivered. The coder then was invited to make tentative codings as the communication was read to him sentence by sentence. As a subject item was thus tentatively coded, the description of that item was given orally and the coder invited to maintain or alter his code after that information was given. When subject items had been completed for each communication, it was read again and coded for mood under the same conditions, and an X placed at the intersection of each subject row and mood column. Each completed sheet was then removed until the whole was completed by one student and then the process was replicated for the other. The coded sheets were then compared with the following results:

1. The investigator coded the twenty communications by seventy-two matrix entries, and the two graduate students by entries of seventy-one and seventy-three matrix entries respectively.

2. One student coding agreed with investigator coding in ninety-four per cent of entries, and the other with eighty-nine per cent of entries. The detailed comparisons are illustrated in Table 2.

Student A thus made seventy-one entries to code the twenty communications, and agreed with the investigator in ninety-four per cent of the entries. The comparable figures for student B are seventy-three and eighty-eight per cent, for an average agreement of over ninety-one per cent. These figures were accepted as indicating that a high level of agreement in the use of the code matrix sheet could be attained.

No test of network coding was made, as once the Table of Organization was completed, such coding was a mechanical task not permitting individual interpretation.

Examples of Communication Content Coding

The method of communication content coding is demonstrated by reproducing various communications and by following the reasoning by which matrix entries are made.

Message 1. "The new curriculum for grade nine Guidance developed by the School System is ready for general use. Teachers wishing to follow the curriculum should call Mrs. XXXXX at the Education Centre before September 8th."

Two moods are in evidence. The first sentence is evidently a Statement of Fact (code E) and the second an Instruction given to interested persons, (code A). The subject content ~~refers~~ to Curriculum (21), to grade

Table 2

Comparison of Three Codings of the Sample

Message No.	Number of Investigator's Matrix Entries	Student A's Codings		Student B's Codings	
		No.	No. of Agreements	No.	No. of Agreements*
1	2	2	2	2	2
2	7	6	6	6	5
3	6	6	6	6	6
4	4	4	4	4	4
5	3	3	3	4	3
6	3	3	3	3	3
7	3	3	3	3	3
8	1	1	1	1	1
9	2	2	2	2	2
10	4	4	4	4	3
11	4	4	4	4	4
12	3	3	2	3	2
13	3	3	3	3	3
14	3	3	3	1	0
15	2	2	2	2	2
16	6	6	6	6	5
17	4	5	4	6	3
18	2	2	2	2	2
19	7	6	6	8	6
20	3	3	3	3	3
Totals	72	71	69	73	64

*with the investigator's codings

nine, that is, to a designated group of Pupils (3), to Guidance (22), the reference to the XXXXXXXX School system might refer to the educational staff, to the Board, and to parents, but this is implicit and is not coded. The first sentence is thus coded E3, E21, E22. The second sentence refers to teachers who are Educational Staff (1) as is Mrs. XXX, and to the Curriculum (21). The second sentence is then coded A1, A21 for a total of five entries on the matrix sheet.

Message 2. "The next school board meeting will be held on Monday, September 13th. Anyone is cordially invited to attend. Included on the agenda is the school opening and statistical report."

The first and third sentences are evidently Statements of Fact, (code E) and the second might also be so regarded. However, inasmuch as the sense of the sentence is to the effect that anyone who wishes to attend may do so, it was coded as an Instruction (A). The subject items are: School Board meeting coded as Board, personnel and operations (5), the school opening and statistical report coded as Policies, regulations, forms, and reports (21) all coded under (E), and since the second sentence refers to attendance at a board meeting, the appropriate code under (A) is (5). The full coding for the three sentences of the communication is thus E5, E21, and A5.

Message 3. "Further to our discussions regarding the establishment of courses in the Polish language at the Senior High School level, our Board adopted the attached resolution at a recent meeting. We would, therefore, request that the Department of Education take steps to establish a committee which might develop the courses we could off [sic] from in September, 1972."

The first sentence is a Statement of Fact, coded as (E) and the second sentence a Suggestion or proposal coded as (C). The subject codings are made as follows: "Courses in the Polish language" coded as "Education, process and purpose" (12), "Senior High School" coded as "Pupils" (3), "our Board adopted the attached resolution" coded as "Board, personnel and operations," (5), "our discussions" and "recent meeting" remain uncoded. In the second sentence, "Committee" is coded as Educational staff (1) and references to "develop the courses we could offer" were coded as "Education, process and purpose" (12). The full coding for mood and content would thus be A3, A5, A12, E1, E12.

Comment on the Coding Examples

The fact that certain items in these examples could not be fitted into the content classification illustrates the difficulty of content analysis. If all items must be capable of classification into exhaustive categories then the number of categories must either be so detailed as to be unwieldy or so few and general that descrimination might be lost. For these reasons the number of content categories was selected to include what were considered to be the most representative areas and the risk accepted that certain items could only be coded as "Other." The categories were thus not intended to be exhaustive but to indicate a frequency of mention of certain areas of content.

As coding of the main body of communications advanced, certain additions were made to the subject content categories. The frequency of mention of charitable projects by which money, goods, or services were collected and distributed to needy persons or groups led to the inclusion of "Charitable undertakings" as Category No. 23. The frequency of mention of In-service training, workshops, and seminars also led to the inclusion of Category No. 24, Professional Development. Category No. 25 was established as "Other."

Re-examination of mood categories led to redefinition of Category A. This category, "Gives Instructions," included conditional instructions of the type "Interested teachers should contact the central office staff." As redefined, this class of instruction was deleted on the grounds that an instruction to a named person or to a named class of persons, who must then take action, is essentially different than a message which does not require that action inevitably follow by intent, but only if other conditions are in evidence. For this reason conditional instructions of the "if-then" type was deleted from Category A and allotted to Category E as specimens of mood E, "Gives explanations, states facts." Thus a message of the type "All persons are cordially invited to attend the Board meeting" was considered as subsumed under "statements of facts."

Analytical Techniques

All communications authorized or dictated and signed by the superintendent over the period September 1st, 1971 to August 31st, 1972 were coded on matrix sheets for both subject and mood content, and additionally for the network by which they were transmitted. Since the School Bulletins were not necessarily the production of the superintendent, these were coded separately and in a different manner than was the case for those communications whose authenticity was not open to question.

The coded matrix sheets were then examined and aggregated in the light of the following questions:

1. What proportions of all communications were transmitted by the various networks if directed within the system, and to what destinations if directed outside the system?

2. What frequencies of each "Mood" of communication were directed over the various networks or to the various destinations, excluding the School Bulletins?

3. What were the frequencies of mention of the various content categories?

4. From these proportions and frequencies, what tentative conclusions may be advanced as to the administrative "style" of the superintendent?

The Analysis of the Bulletins

Analysis began with the examination of the School Bulletins, which were considered to be a form of communication of a different class to the other forms, in that they were authorized but not necessarily written in all cases by the superintendent. Since the authorship of this material was in doubt and was not traceable, all analysis in terms of mood was deemed inappropriate and unlikely to yield any usable data as to the superintendent's style. Hence subject content analysis alone was made.

Since the distribution of the Bulletins was to all personnel within the system, the network employed was considered to be the *Contracted Dendrite* as previously defined. This definition caused some difficulty. In the case of a message of the type "All principals should ensure that Form X is completed in respect of all Grade I Pupils," the message cannot be considered as being addressed to principals, in that the Bulletin was dispatched by the contracted dendrite to all system personnel. In such cases "principals" was regarded as a subject content item rather than as an addressee, that is, as being about principals rather than to them.

The results of the analysis of the School Bulletins is displayed in Table 3.

The following observations may be made:

Table 3

Number of Communications Coded by Subject and Month

	September	October	November	December	January	February	March	April	May	June	Total	Percent
No. of Communications	67	24	34	26	31	33	54	33	49	22	373	
Subject Categories												
1. Educational	44	27	15	15	22	13	33	28	33	16	263	24
2. Non-educational staff	14	2	3	5	2	1	6	1	4	3	41	4
3. Pupils	16	14	7	9	12	14	7	13	13	3	108	9
4. Parents	1	1	1	-	-	3	2	2	1	-	11	1
5. Board	6	3	4	3	1	4	4	6	3	1	35	3
6. Property	4	-	1	1	1	2	2	2	2	1	16	1
7. Supplies, educational	2	3	-	-	3	1	6	3	6	2	26	2
8. Supplies, non-educational	-	-	-	1	-	-	-	-	-	-	1	-
9. Equipment, educational	3	1	1	-	-	1	1	2	-	-	9	1
10. Equipment, non-educational	1	-	-	-	-	-	-	-	-	-	1	-
11. Budget	9	3	-	4	3	5	11	6	6	3	50	5
12. Education	14	16	10	5	18	12	13	13	7	5	113	10
13. Discipline	-	-	-	-	-	-	-	-	-	-	-	-
14. Health, safety	6	2	-	2	1	5	3	3	-	-	22	2
15. Educational organizations	4	4	4	2	1	7	4	5	8	2	41	4
16. Non-educational organizations	1	-	1	1	1	1	3	3	1	-	13	1
17. Social	8	3	1	1	5	5	6	12	-	1	42	4
18. Transportation	1	-	-	-	1	2	-	1	-	3	8	1
19. Religious	2	3	1	-	2	5	1	7	4	1	26	2
20. Promotion, etc.	4	6	1	6	4	8	12	7	10	3	61	6
21. Policies, etc.	21	9	2	8	5	9	14	4	8	5	85	8
22. Guidance, etc.	2	2	2	4	4	4	1	4	1	-	24	2
23. Charity	3	2	5	1	1	2	-	-	-	-	14	1
24. Professional development	9	1	2	1	9	3	3	8	1	5	42	4
25. Other	5	6	1	4	7	-	6	5	7	5	46	4
Totals	180	108	65	73	103	122	148	135	115	59	1108	99

1. Each entry under the various months and opposite the subject content categories signifies the number of messages in which mention is made of the subject content item. Thus, in September, 1971, of 67 communications, 44 of them had some reference to the educational staff. The percentage figure indicates what proportion of the 1,108 subject content entries were located in each category.

2. Four categories contained fifty-two per cent of all subject content entries:

24 per cent in No. 1, (Educational Staff)

10 per cent in No. 12, (Education, process and purpose)

9 per cent in No. 3, (Pupils)

8 per cent in No. 21, (Policies, regulations, forms, and reports)

3. Of the peak frequencies of category entries by months,

9 of such peaks occurred in September

5 of such peaks occurred in April

4 of such peaks occurred in both January and March

2 of such peaks occurred in February

1 of such peaks occurred in November, December, and May

No such peaks occurred in October or June.

The elements of an annual rhythm of Bulletin content may be represented here, but further analysis was not attempted.

4. The "Other" category included such items as admissions, attendance areas, telephone numbers, lost golf jackets, posters, golf award cups, conservation, Arbor Day, overtime, plug-ins, publicity, contests, bequests, insurance and postal codes. This

variety coupled with low frequency of mention and the difficulty of framing new but broad categories to embrace these diverse matters made the inclusion of this category open to serious question. The category was retained, if only as evidence of the difficulty of framing exhaustive and all-inclusive classifications.

The Analysis of Communication - Letters and Memoranda

Since many of the communications present in the form of carbon copies of letters were also present in the taped translations of the stenographic shorthand notes, and had to be discounted after comparison of the two versions, the decision was made to conduct the analysis of these two sources together and without differentiation. Each message was coded for network, for subject, and for mood. The network was an automatic classification from the addressee, who was not, as in the Bulletin, an object of subject content analysis. Thus a communication addressed to a principal would not be coded as mentioning Professional staff by that fact, but only if another principal, or the abstract subject of the Principalship for example, was contained in the communication.

The superintendent originated 338 formal written communications in the twelve month period between 1 September 1971 and 31 August 1972, which were directed as follows:

a) Outside the system as noted:

Destination	No.	Percentage of Total
Suprasystem	21	6%
Federal suprasystem	3	1%

Other systems	114	34%
Citizenry	8	3%
Total	142	43%

b) To the Trustees as noted:

Destination	No.	Percentage of Total
Chairman	5	1%
Trustees	56	17%
Total	61	18%

c) Within the system as noted:

Destination	No.	Percentage of Total
B stratum	10	3%
C stratum	22	7%
D stratum	10	3%
E stratum	22	7%
B,C,D,E strata	7	2%
B,C,E strata	1	1%
B,C,D strata	1	
C,D,E strata	1	
C,D strata	5	1%
C,E strata	3	1%
B,E strata	1	1%
B,D strata	1	
B,C strata	4	

Destination	No.	Percentage of Total
Principals	14	4%
Asst. Principals	7	2%
Teachers	15	4%
Pupils	3	1%
Parents	4	1%
Totals	131	39% *

* All percentages rounded off to the nearest whole number, and totals recalculated.

The proportion of communications directed outside the system is of interest, for it tends to indicate that much of the superintendent's attention was directed to regulating and maintaining relations with the environment. While communications with the Department of Education were to be expected, the fact that over one third of his written formal communications was with "Other Systems" such as school divisions, chambers of commerce, Universities, and cultural or ethnic societies was unexpected. Such contacts in such frequency did not appear to devolve directly from his position as a chief executive officer of a school district.

The fact that the trustees received 18 per cent of all formal written communication tends to indicate that the provision of information to the school board is a major objective of the superintendent.

Mention should be made of the fact that of 334 communications, 99 were in response to letters received.

Tabulation of the content of these communications is made in Table 4.

Each entry in rows and columns is to be read as indicating the number of messages of 334 total in which reference is made to a given subject or mood item. Thus, in the top row under E, the entry indicates that 157 references were made to Educational staff in the mood "Gives explanations, states facts."

The following observations may be made:

1. Those four categories which contained fifty-two per cent of all subject content entries in the Bulletin analysis, contained fifty per cent of the subject content entries in these communications, which will be termed the "general communications."

These subject content items are:

22 per cent in No. 1. (Educational staff),

13 per cent in No. 12. (Education),

9 per cent in No. 3. (Pupils)

6 per cent in No. 21. (Policies, regulations, etc.).

Additionally there are eight content categories for which almost identical percentages were recorded in both the Bulletins and the general communications. These are:

Item 3 (Pupils), 9 per cent,

Item 4 (Parents), 1 per cent,

Item 8 (Supplies, non-educational), less than 1 per cent,

Item 10 (Equipment, non-educational), less than 1 per cent,

Item 13 (Discipline), less than one per cent,

Table 4

Analysis of General Mood and Content

SUBJECT ITEM	MOOD									
	INSTRUCTIONS		SUGGESTIONS		STATEMENT OF FACT		APPROVAL		TOTAL	PERCENTAGE
	A GIVES	B INVITES	C GIVES	D INVITES	E GIVES	F INVITES	G GIVES	H DECLINES		
1. Educational staff	22		45	1	157	2	10	7	244	22
2. Non-educational staff	5	0	4	-	17	1	1	2	30	3
3. Pupils	5	-	9	-	74	3	6	4	101	9
4. Parents	-	-	1	-	14	-	-	-	15	1
5. Board	2	-	13	-	47		3		65	6
6. Property	4	-	2	-	24		1		32	3
7. Supplies, educational	-	-	-	1	10				10	1
8. Supplies, non-educational	-	-	1	-	1				2	-
9. Equipment, educational	2	-	4	-	11	1			18	2
10. Equipment, non-educational	-	-	1	-	2	-			3	-
11. Budget	4	-	13	1	57	1	3	1	80	7
12. Education	11	-	24	1	98	2	7	2	145	13
13. Discipline	-	-	-	-	1		1	1	3	-
14. Health, safety	1	-	4	-	14		2		21	2
15. Educational organizations	1	-	6	1	25		1		34	3
16. Non-educational organizations	-	-	2	-	11		-		13	1
17. Social	3	-	1	-	22		1		27	2
18. Transportation	-	-	5	-	16	1	1	1	24	2
19. Religious	-	-	7	-	21	-	-	-	29	3
20. Promotion, etc.	3	-	4	1	37	1	1	2	49	4
21. Policies, etc.	9	-	8	1	40	1	1	2	62	6
22. Guidance, etc.	1	1	6	1	32	1	1	1	43	4
23. Charity	-	-	1	-	3	-	3	-	7	1
24. Professional development	2	-	8	-	14	-	2	1	27	2
25. Other	3	-	2	-	25	-	1	1	32	3
TOTALS	78	1	171	8	773	14	46	25	1116	100
PERCENTAGE OF TOTAL	7	-	15	1	69	1	4	2		99

Item 14 (Health), 2 per cent

Item 16 (Non-educational organizations), 1 per cent

Item 23 (Charity), 1 per cent

These similarities indicated that the subject content of both the bulletins and the general communications was rather constant. Whether this reflects the "style" of the superintendent or the orientation of the system cannot be assessed here.

As concerns the analysis of "mood," the predominant mood was E (Gives explanations, states facts) with 69 per cent of the total. The next most frequent mood was C (Gives suggestions, advice, proposals) with 15 per cent, followed by mood A (gives instructions) with 7 per cent. Entries in moods B (Invites instructions), D (Invites suggestions, advice, proposals), and F (Invites explanations, statements of facts), were negligible.

The inference may then be made that the preferred mood of written, formal communication of this superintendent was to state facts, to give advice, and to issue instructions, in that order.

Entries in the moods "Gives approval" and "Declines to give approval," though only forming four per cent and two per cent respectively of the total communication, indicate that approval was given to proposals rather more frequently than it was denied.

As regards the network analysis, mention has already been made of the high proportion of communication directed outside the system. Since the environment is not hierarchically organized, in the sense that it does not constitute a single system, no network analysis could be carried out, by the classification advanced in this paper, on external communication. Such analysis was confined to the hierarchically stratified stations of the system, ranging from the B stratum stations to the teachers, and omitting pupils and parents. This class of communication is termed the internal communication.

Only three networks were employed by the superintendent in his transmissions of internal communications:

1. Dendritic networks to the four stations on the B stratum.
2. Contracted dendrites to all B,C,D, and E strata combined
3. Palmar fans or rays, depending on whether the communications were singly or multiply addressed, to stations on strata other than the B stratum.

When the internal communications were reduced by the totals addressed to pupils and parents, 124 communications remained to be analyzed by network, and were distributed by pattern as follows:

1. Dendritic patterns, 8 per cent,
2. Contracted dendrite patterns, 6 per cent,
3. Palmar rays or palmar fans, 86 per cent.

A reasonable interpretation of these proportions is that the superintendent prefers, or must, communicate direct with lower strata stations without following the "chain of command." That is, rather than pass a message to a C or D stratum station through intermediate stations, he communicated immediately with the final station.

When the communication patterns are mapped over the Table of Organization, the result was as depicted in Figure 35. Because some communications were multiply addressed, the total of destinations of communication does not coincide with the number of communications.

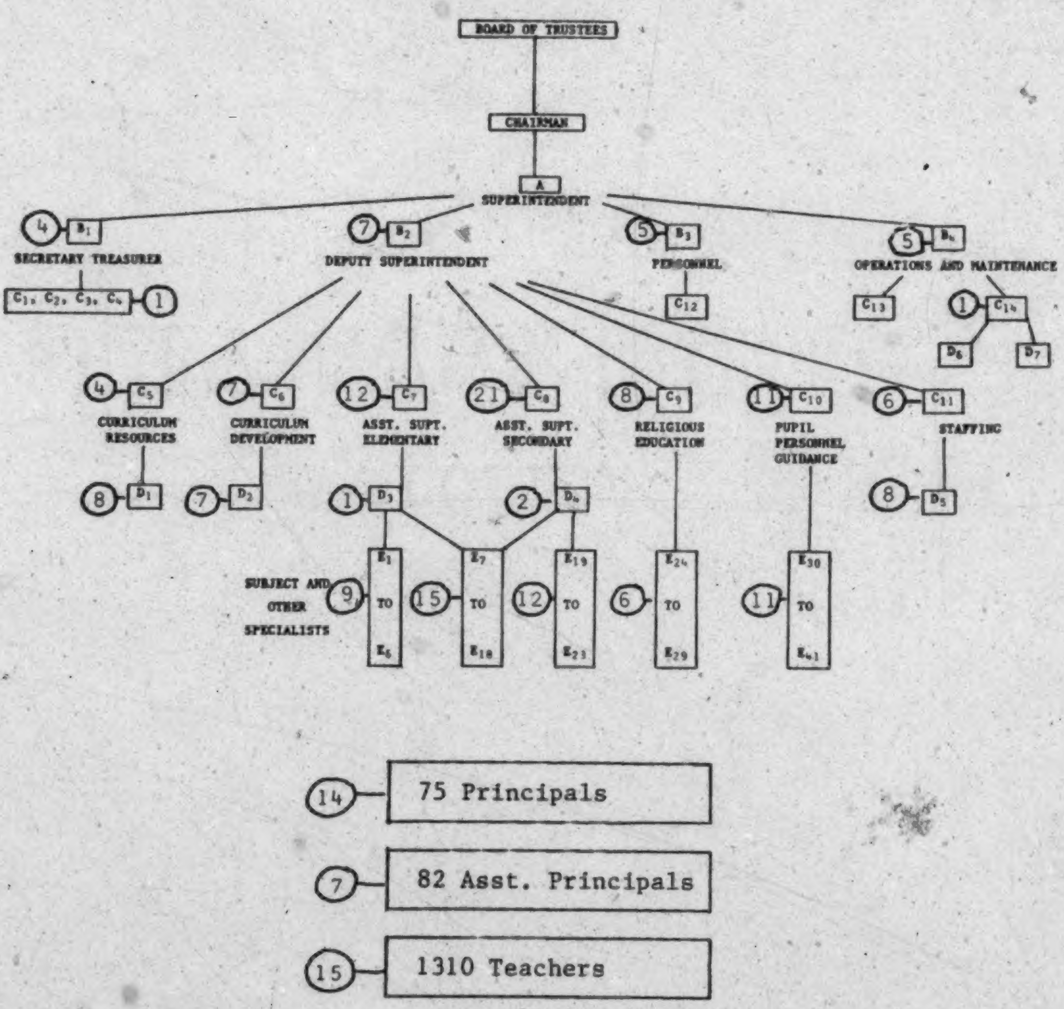

BOARD OF TRUSTEES
CHAIRMAN
A
SUPERINTENDENT
4
B1
SECRETARY TREASURER
C1, C2, C3, C4
1
7
B2
DEPUTY SUPERINTENDENT
5
B3
PERSONNEL
C12
5
B4
OPERATIONS AND MAINTENANCE
C13
1
C14
D6
D7
4
C5
CURRICULUM RESOURCES
7
C6
CURRICULUM DEVELOPMENT
12
C7
ASST. SUPT. ELEMENTARY
21
C8
ASST. SUPT. SECONDARY
8
C9
RELIGIOUS EDUCATION
11
C10
PUPIL PERSONNEL GUIDANCE
6
C11
STAFFING
8
D1
7
D2
1
D3
2
D4
8
D5
SUBJECT AND OTHER SPECIALISTS
9
E1 TO E6
15
E7 TO E18
12
E19 TO E23
6
E24 TO E29
11
E30 TO E41
14
75 Principals
7
82 Asst. Principals
15
1310 Teachers

Figure 35

Communications Received Within the System

The seven contracted dendrite communications to all B,C,D, and E stratum (central office) staff have been omitted from the map as being general notices which will contribute little to knowledge of the superintendent's network usage. The figure is to be read as noted:

1. The lines connecting locations on strata indicate the formal chain of responsibility.

2. The circled numbers to the side of stations or groups of stations indicate the numbers of communications transmitted to that station or group of stations direct from the superintendent.

The following observations may be made:

1. All stations on the B stratum received communications. This network is complete and carried 21 deliveries of the 208 involved in this analysis, or 10 per cent.

2. Communication to the C stratum is incomplete in that 5 of 14 stations, or 36 per cent, received no communication. The C stratum stations received 71 of 208 deliveries involved in this analysis, or 34 per cent.

3. All but two stations on the D stratum received communication. Such communication amounted to 26 deliveries of the total of 208, involved in this analysis, or somewhat less than 13 per cent.

4. Communication to the E stratum is incomplete in that 4 of 41 stations, or almost 10 per cent, received no communication. The E stratum stations received 53 of 208 deliveries involved in this analysis, or 25 per cent.

5. Of 75 principals, 14, or 19 per cent, received communication, and such communication involved 14 deliveries, or 7 per cent of the total involved in this analysis.

6. Of the 82 assistant principals, 7, or 9 per cent, received communication, and such communication amounts to 3 per cent of the total involved in this analysis.

7. Of approximately 1,310 teachers, 15, or almost 1 per cent, received communication, and such communication amounts to 7 per cent of the total deliveries involved in this analysis.

8. The following list indicates the average communication deliveries per station on each hierarchical level:

Level or stratum	Percentage deliveries of total	Stations per level	Average per cent deliveries per station
B	10	4	2.5
C	34	14	2.4
D	12.5	5	2.5
E	25	41	.6
Principals	7	75	.09
Assistant Principals	3	82	.04
Teachers	7	1,310	.005

These frequencies of delivery among the various strata tend to emphasize the non-hierarchical nature of the communication patterns, especially in the three upper strata. The D strata stations received on the average as much communication as did the highest subordinate stratum, the B level, and both received only slightly more than did the C stratum stations. The pattern is predominantly of a palmar nature, cutting across the chain of command.

The possibility existed that analysis of the subject and mood content of the superintendent's internal communication would reveal different and important frequencies from those which emerged from similar analysis of the general communications. For that reason such an analysis was made of all communications addressed to all lettered strata, and inclusive also of principals, assistant principals, and teachers, but exclusive of pupils and parents. Such analysis was thus confined to the salaried employees of the system. The results are as depicted in Table 5.

Each entry in the table is to be read as indicating the number of messages of a total of 124 in which reference is made to a given subject content item and in a given mood. Thus, at the intersection of Item 12 and column C, the entry 5 indicates the number of references to "Education, purpose and process" in the mood C, "Gives suggestions, advice, proposals" occuring in 124 communications.

The following observations may be made:

1. Consistency of distribution of subject content which was noted in the analysis of the Bulletins and the general communications, persisted in the internal communications.

Table 5

Analysis of Internal Mood and Content

SUBJECT ITEM	MOOD									
	INSTRUCTIONS		SUGGESTIONS		STATEMENT OF FACT		APPROVAL		TOTAL	PERCENTAGE
	A GIVES	B INVITES	C GIVES	D INVITES	E GIVES	F INVITES	G GIVES	H DECLINES		
1. Educational staff	16	-	15	-	72	2	-	7	112	26
2. Non-educational staff	3	-	1	-	6	1	1	2	11	3
3. Pupils	4	-	1	-	19	1	1	2	28	6
4. Parents	-	-	1	-	4	-			5	1
5. Board	-	-	1	-	10	-			11	3
6. Property	3	-	-	1	10	-			14	3
7. Supplies, educational	-	-	-	-	6	-			6	1
8. Supplies, non-educational	-	-	-	-	-	-			-	-
9. Equipment, educational	2	-	2	-	3	1			8	2
10. Equipment, non-educational	-	-	-	-	1	-			1	-
11. Budget	4	-	4	-	17	1			26	6
12. Education	2	-	5	-	37	1	2	2	49	11
13. Discipline	-	-	-	-	-	-			-	-
14. Health, safety	1	-	-	-	3	-			4	1
15. Educational organizations	-	-	-	1	9	-			10	2
16. Non-educational organizations	-	-	-	-	5	-			5	1
17. Social	-	-	-	-	8	-			8	2
18. Transportation	-	-	2	-	9	1		1	13	3
19. Religious	-	-	3	-	9	-		-	12	3
20. Promotion, etc.	-	-	2	-	26	1	1	2	32	7
21. Policies, etc.	7	-	2	-	18	-	-	2	30	7
22. Guidance, etc.	1	-	2	1	15	1	1	1	21	5
23. Charity	-	-	1	-	-	-		-	-	-
24. Professional development	1	-	3	-	6	-		1	11	3
25. Other	1	-	2	-	8	-		1	12	3
TOTALS	45	0	47	3	301	10	6	21	433	99
PERCENTAGE OF TOTAL	10	0	11	1	70	2	1	5	100	

2. Considerable differences are to be noted in the distributions under the various mood categories. While the frequencies in both the general and internal communication under mood E (Gives explanations, states facts) remain within one per cent of each other (70 per cent and 69 per cent), the frequencies included under mood A (Gives instructions) increased from 7 per cent in the analysis of the general communications to 10 per cent in the hierarchically ordered internal communications. Conversely, the proportion of communication included under mood C, "Gives suggestions, advice, proposals" in the analysis of the general communications declined from 15 per cent to 10 per cent in the analysis of the internal communications. That is, the superintendent, as might be expected, gave instructions to his subordinates more frequently, and offered advice somewhat less frequently, than when communicating with persons who were not so subordinate.

3. From Tables 4 and 5, occasions on which the suggestions, advice, and proposals from other sources (mood C) were invited were extremely few, involving less than one per cent of all communications in both cases. The attachment of a label, whether of style or personality, to this statement of fact is unwarranted. Since these analyses were concerned only with written or dictated communication and ignored all oral messages, the analyses did not reveal whether the superintendent had canvassed his subordinates' opinions in conversation or by telephone, and then confirmed

decisions, which had been made by consensus, or majority opinion, or by other means, in writing. On the other hand, oral communication may follow the patterns and frequencies which have been revealed by the analysis of written communication, and may thus be typical of a superordinate who rarely consults others or invites ideas from subordinates. The evidence thus far does not warrant further inference beyond the statement of an observed frequency.

4. The "Other" category, content item 25, includes such subject matter as assigned duties, attendance, bilingualism, cafeteria operation, dog excreta on school grounds, educational research, overtime, the Prime Minister's visit to Alberta, and public opinion. This category is illustrative of the variety of topics rather than exhaustive of a class of topics.

Summary and Implications of the Investigation

The purpose of this chapter was to investigate the formal written communication of a superordinate figure in a large urban school district in terms of his employment of the networks of communication advanced in this work. Additionally a system of classifying communication content in terms of subject matter and mood of utterance was devised. From analysis of formal written communication in these terms, some inferences as to a style of administrative communication might be made, bearing in mind the fact that formal written communication was but a part of the total communication.

The first sample of the superintendent's communications to be analyzed was the School Bulletins, whose authors could not be established with any precision. The superintendent edited and approved the entire content before each issue, in addition to contributing materials himself. These materials were analyzed only in terms of subject content. Inferences from mood content were considered unwarranted in view of the doubtful origin of the material. A second source of formal written communication was the superintendent's personal correspondence in the form of carbon copies of letters, or where these were non-existent, in the form of stenographic shorthand records which were translated to recorder tapes. These materials were analyzed for subject and mood content, and for the networks by which messages were transmitted. For the purpose of this summary this material will be termed the general communication.

From the general correspondence a sample was taken which included those persons who had a definite subordinate relationship to the superintendent, for the possibility was evident that communication within the hierarchical system might be different in subject matter and mood from that which was directed outside the system. These communications to subordinates will be termed the internal communication for the purpose of this summary. Since network analysis was applicable to internal communications alone, analysis of the general communications was made in terms of destination of communications rather than in terms of networks.

In terms of methodology the investigation tended to demonstrate that:

1. The advocated classification scheme did afford material which might lead to useful inferences as to communicative style of an administrator, but such inferences would be necessarily limited if analysis was confined to formal and written communication. Network analysis was assisted by content analysis of subject and mood.

2. Analysis of communication of a single superordinate was of limited value in assessing the communications of an organization, and, even in the case of a single individual, the analysis of incoming as well as outgoing communication might have been of great additional value.

3. No system of classifying subject content is likely to be so comprehensive as to be entirely exhaustive of all subject content. The classifications of various "moods" adopted herein might be modified so as to include finer shadings of this aspect of communication.

In terms of assessing the administrative communication "modes" of the superintendent, the investigation tended to demonstrate that:

1. The subject content of the Bulletins, the general communications, and the internal communications exhibited a distribution among the items which was remarkably constant. This constancy might indicate that either the superintendent supervised

the preparation of the Bulletins so closely that his communication style, or personality, or system of priorities, pervaded all three sources and samples, or that the orientation of the system was such that a "set" of subject priorities imposed this consistency.

2. The Superintendent, at least as demonstrated by his formal written communications, tended to ignore the hierarchical chain of command and to communicate directly with stations at all levels of the system. This palmar communication tended to fall off progressively below the D stratum of the hierarchy.

3. The superintendent tended to state facts in his communications, and then to give advice, and to a lesser degree to issue instructions in the general communications. In the internal communications, the tendency was for him to reduce the frequency of advice and to increase the frequency of instructions to his subordinates. In few instances did he appear to seek advice or proposals from others. From the great preponderance of the mood "Gives explanations, states facts," the inference may be justifiable that these "moods" do not indicate a feeling of personal infallibility on his part.

4. A reasonable expectation may be entertained that the combination of network usage, of subject content analysis, combined with a frequency of various moods of communication issuance might identify an administrative communication mode, or at least provide a set of base measurements from which such an assessment might be attempted. In the absence of another similar investigation this must remain a speculation.

Chapter 7

SUMMARY, IMPLICATIONS, EXTENSIONS, AND PROPOSITIONS

This chapter presents a summary of the theories advanced in this thesis, together with certain implications and suggestions for further research, and concludes with the statement of a number of propositions which might be tested empirically by principal reference to the network classification advanced in this study.

SUMMARY, IMPLICATIONS, AND EXTENSIONS

The opinion was advanced that known descriptors of communication networks in formal organizations were either so broad and general as to have limited usefulness, or so vague and imprecise as to present little more than a label. A system of classification of networks was developed which attempted to avoid these deficiencies. The classification adopted stemmed from the fields of botany and geomorphology, and could be grouped under three broad headings: those which had single upward access from one station to others, those which had multiple upward access from one station to others, and those which were horizontal between stations of equal hierarchical status.

More specifically, the following terms were devised:

1. Under the single upward access model

   (a) Basic dendrite

   (b) Contracted dendrite

   (c) Dendritic fan

   (d) Dendritic ray

   (e) Palmar fan

   (f) Palmar ray

Each of these precisely describes a network and each is applicable to any hierarchically structured organization regardless of size.

2. Under the multiple upward access model

The basic reticulation, applicable to communication in any organization, which is directed cross-wise to superordinates or to subordinates other than those to which or for which the originating station is directly responsible.

3. Differentiation was made between "feed-on" and "feed-through" modes of communication. The first implies that stations could particularize and augment instructions from above, while the second assumed prescriptive orders, denying discretion to subordinates who merely pass communications unchanged through their stations to subordinates.

4. Under horizontal communications between hierarchical equals

   (a) Horizontal ray

   (b) Horizontal fan

The foregoing classifications tend to give an impression of a monolithic organization, primarily based on direction flowing from superordinates to subordinates. Recognition of the fact that superordinates may frequently seek advice from subordinates, or that equals may confer to seek an agreed solution to a problem was given by another frame of reference, the contoured communications map. In brief, where members of an organization communicate with each other in circumstances where the hierarchical levels are not in evidence, the network system does not apply, since it is based on evident hierarchical relationships. Where, for example, a superordinate asks the opinion of a subordinate or subordinates, those who seek and those who give such opinion are on terms of temporary equality, and this is termed a contoured relationship rather than a network pattern. If this state of equality persists to a decision based on consensus or majority opinion, the contouring is continued; but if the decision is made by the superordinate alone after hearing the opinions of others, then the contoured situation disappears and is replaced by a hierarchical situation. The contoured situation is thus a model which allows for collegial relationships, and is a matter of interaction analysis rather than of networks. The issue of such interaction analysis in contoured situations was left incompletely developed.

A theoretically oriented basis having been constructed, a comparison was made of imaginary data by means of a sociogram, socio-metric clique analysis, and what was termed "mesh analysis" to discover the strengths and weaknesses of each. The conclusion was reached that for the purpose of communication analysis in formal organizations, the mesh analysis was more effective in preserving data, much of which must inevitably be lost whatever method of data aggregation and analysis is employed.

Following this comparison, mesh analysis was applied to data gathered in another research context where sociometric data-gathering methods were used. A claim was advanced on this analysis that the technique was effective on real data as opposed to imaginary data, but that information as to communication content, direction, and sequence would have been additionally helpful.

The formal written communications of a superintendent in a large urban school district were then collected for the period September, 1971 to August, 1972, and analyzed in terms of networks chosen, frequency of network usage, and also in terms of subject content, and mood of issuance according to a schema which had been developed and tested for reliability. Data aggregated by these various codings offered, in combination, a basis for recognition of an administrative communication modes of the superintendent, though these data were admittedly inadequate for the development of a classification of such modes. Because a single superordinate figure was investigated, the full range of networks as developed theoretically could not be displayed.

The restriction of data gathering to formal written communication and the ignoring or discounting of oral communications in turn restricted the inferences that otherwise might have been made from observed frequencies and proportions of subject content, mood, and network analysis.

The implications of the study are that a means of classifying formal communication patterns in hierarchically structured organizations has been devised. This classification describes, with some precision, the networks which may be found in such organizations of any size. The classification is exhaustive; that is, all formal communication made in a hierarchically structured organization can be located within the schema.

Should this claim be conceded, that interest which has been attached to the study of informal communications might be extended to the study of formal communication networks. Even within the confines of such broad and general divisions of organizational communication as "Vertical" and "Horizontal," valuable research has been done in the past. The method of analysis presented here is considerably finer and more differentiated than two broad directional components.

Investigation might be directed to some of the following topics:

1. What kinds of communication are typically transmitted by the various networks in organizations? This will require content analysis in additional to network analysis.

2. Does the "mode" of communication of a superordinate influence in turn the "mode" of his subordinates?

3. Can a classification of communicative modes be meaningfully related to a leadership style?

4. Do certain frequencies of communication network usage relate to any personal psychological factors in the originator, or relate to any psychological reactions in the receiver?

5. Can experimental groups be organized in hierarchical structures and restricted to various communication networks for communication so as to test the efficiency of problem solution and the satisfaction of participants, as has been done in the investigation of small groups?

6. Are frequencies of network usage associated with factors of personality, of technology, or of organizational structure?

7. Superordinate and subordinate figures in formal organizations may conduct a great deal of routine communication which would be required of any incumbent in a given position. Investigation of network usage might be directed to the close examination of communications related to critical incidents rather than to the study of all communication over a given time period.

Extension of Communication Theory

In this study the basic elements of a theory of communication network classification have been presented. Some additional refinements might be added in further identifying variations of the basic modes. For example, a reticulation involving B and C strata differs from one which involves B and E strata, and a schema to code this and other differences might be developed. In very large organizations, the coding and identification of the various networks, their proportions and their completeness or otherwise might be undertaken economically by computer programs.

Considerable emphasis in this study has been placed on the value of accompanying network analysis with analyses of subject content and mood. In cases of horizontal communication and horizontal but contoured communication, the suggestion was made that subject content and mood might be meaningfully combined in a form of interaction analysis.

One difficulty in the study of communication is the issue of quantification. A might communicate with B on ten different occasions, while he communicates with C on but one occasion. Does A communicate ten times as much with B as he does with C? Certainly he communicates ten times as frequently, but on that one communication with C he might convey as much and more information than was conveyed on ten occasions with B. Network, subject content, and mood analysis are ineffective in dealing with this aspect of communication.

Other or additional concepts might be employed in the analysis of content and mood. In this study, differentiation between prescriptive orders which preclude the exercise of discretion, and instructions which allow such discretion, proved impossible. While the distinction appears obvious in the abstract, it was obscure in practical examination of real correspondence.

The essential elements of an order in the terms defined above might be "Who does what, when, where, how, and why."

If the following messages are studied, which are orders and which are instructions?

1. "Will A meet B at his convenience?"

2. "Will A meet B at nine a.m. on Monday, January 7th?"

3. "Will A meet B at nine a.m. on Monday, January 7th, to discuss budget allocations?"

4. "Will A take Flight 456 from Montreal at 6 a.m. in order to meet B at Toronto airport at nine a.m. on January 7th to discuss budget allocations?"

Communication 1 appears to be an instruction and communication 4 an order, but how are communications 2 and 3 to be classified? Is the opening "Will A" different in meaning from "A will," or is one a more polite version of the other? These issues appear to offer interesting lines of inquiry in communication theory.

Concerning the issue of content analysis, a system of classification of content which is not restricted to use in the investigation of one type of organization would be extremely useful for the comparison of different organizations. The subject content analysis developed in this study is obviously unsuited to the study of the communications of a military organization, or to organizations other than those concerned with education. Another classification, perhaps based on system theory, might have more general applicability while retaining discrimination in the needed categories.

In general, a desirable extension of communication theory as related to formal organizations would be the development of a taxonomy by which networks, content, mood, and quantification of communications in any organization might be analyzed and compared with those of any other organization.

PROPOSITIONS RELATED TO NETWORK ANALYSIS

The development of a system of classification of communication networks in hierarchically structured organizations is pointless unless it leads to the advancement of propositions which might be empirically tested and which lead to conclusions which are either different in kind or in degree to those which are or have been made available through other conceptualizations.

The following propositions are advanced, which relate communication networks to other conditions or circumstances of formal organizations, and which may be tested empirically by principal reference to that system of network classification advanced in this thesis.

Each proposition is advanced, and then, where appropriate, a supporting argument is adduced citing examples of related circumstances or occasions. Such examples have been extracted from general historical and administrative literature.

Proposition 1

"In organizations where at least one of the following are valued: secrecy, compartmentalization, and accountability, dendritic networks of communication will tend to be employed more frequently than in organizations where such conditions are not so valued."

The following arguments support this proposition:

(a) The dendrite is a communication network which, when used as a command system, is controlled from the apex. In the absence of reticulated and horizontal networks which alone can provide cross-connections from one sub-dendrite to another, no information can be transferred formally outside the chain of command. Where the dendrite is employed for the upward transmission of information no station has a choice of upward access; only one route is available. The single station which has access to all information lies at the apex. This condition makes for secrecy and compartmentalization. In effect, the sub-dendrites are insulated from cross-contact.

(b) Since the transmission of organizational information in the dendrite follows predictable channels, any failures can be traced with precision; no station can excuse failure on the grounds that another station had equal access to the necessary information and might equally well have been expected to take the requisiste action. This "passing the buck" or ambiguity with respect to transmission may be inherent in horizontal and reticulated networks but is minimized by the use of the dendrite. Failure can be located between one transmission and one receiving station. The dendritic network is thus suited to the enforcement of strict accountability in communication. In this context, "accountability" does not refer to the efficient performance of other duties than communication.

Proposition 2

"Organizations which operate in a stable environment where tasks are routinized, and where staff turn-over is low will employ dendritic feed-back channels more frequently than will organizations which operate in an unstable environment, which do not operate routinely, or which have a high rate of staff turn-over."

The following arguments are offered in support of this proposition:

(a) Newly established organizations encounter an environment which has not been entirely defined, and must evolve structures and procedures to cope with unexpected circumstances. As the range of the environment becomes explored, precedents will tend to evolve and to be stabilized into routines. Roles will tend to be taken by incumbents, and policies will be developed which will govern appropriate behavior in normal circumstances. The unusual circumstance will be referred to the immediate superior, who will either issue a ruling on necessary action, or who will again refer the circumstance, should it lie outside his assigned sphere of authority or competence, to his own immediate superior. This system of upward reference is, in fact, dendritic feed-back of intelligence.

(b) Conversely, newly established organizations or those in contact with an unstable or ill-defined environment might be expected to have few routinized responses and may therefore improvise ad hoc communications which attempt to contact problem solvers direct and not necessarily through a regular chain of command.

Proposition 3

"In an organization where extreme stress or uncertainty occurs at a lower echelon level, and where this stress may have crucial effects on the aims of the organization, superordinates will employ palmar networks of communication more frequently than where these stressful conditions are absent."

The following arguments are advanced in support of this proposition:

(a) If the aims of the organization are endangered by conditions occurring at lower echelon levels, superordinates will tend to seek immediate contact with stations at the zone of danger by palmar communication. Any other network must pass messages through intermediate stations, which will normally cause delay and may subject the messages to modification of content or tone. The superordinate will normally not subject his own declared intent to the hazard of delay and misinterpretation en route to its destination. This mode of communication is extremely likely to cause resentment in the minds of incumbents of intermediate but by-passed strata, unless the necessity for such action is clearly justified.

In this latter connection some instances may be cited. Warlimont (1964:206) quotes from Halder's diary thus:

> The experiences of today have been shattering and humiliating. The C.-in-C. is little more than a post box. The Führer is dealing over his head with Commanders-in-Chief of Army Groups.

This entry refers to Hitler's actions in the winter of 1941 in by-passing the Army Commander-in-Chief and issuing orders directly to subordinates.

Correlli (1960:132) referring to a similar use of palmar communication by General Ritchie in 1942 writes:

> The uncertainty of Ritchie's leadership in the last fortnight led to one further result: Godwin-Austin asked Auchinleck to relieve him of his command, "as he felt," in Auchinlek's words, "that General Ritchie has displayed a lack of confidence in him by issuing orders directly to his subordinate commanders." Auchinlek, as he had to, upheld his army commander and the Eighth Army lost an able, strong general and a much loved man.

This theme is continued by Catton (1960:267-268) who quotes a letter from General Grant to General Halleck to this effect:

> . . . As I believe it is generally understood through this army that my position differs but little from that of one in arrest and as this opinion may be much strengthened from the fact that orders to the Right Wing and Reserve, both nominally under my command, are transmitted direct from headquarters without going through me, I deem it due to myself to ask either full restoration to duty, or to be relieved from further duty with this Department.

Halleck's reply was to the effect that if it was thought necessary, orders would be sent direct to commanders of "army corps, divisions, brigades or even regiments." But Grant himself, in spite of his previous protest of this mode of communication, sometimes employed it. Grant (Johnson and Buel, 1956:98) writes:

> I tried to make General Meade's position as nearly as possible what it would have been if I had been in Washington or any other place away from his command. I therefore gave all orders for the movements of the Army of the Potomac to Meade to have them executed. To avoid the necessity of giving orders direct I established my headquarters near his, unless there were reasons for locating them elsewhere. This sometimes happened, and I had on occasions to give orders direct to the troops affected.

These examples tend to indicate that palmar communication networks, if concerned with issues that are by usage are within the area of responsibility of a subordinate intermediary, may subvert morale.

Proposition 4

"Where, in an organization, a superordinate conceives that he alone possesses insight or expertise concerning the general or particular problems facing the enterprise, that superordinate will tend to employ the dendritic communication network in the "feed-through" mode, where messages and communications are passed through intermediate hierarchical stations unchanged in content, rather than "feed-on" modes where general intentions are passed down the dendrite or reticulation and are progressively augmented and particularized in passage and hence allow of the exercise of subordinate discretion. In extreme cases, where in addition to the belief that the superordinate has unique powers of perception, this belief is coupled with a belief that the intermediaries are disloyal or incompetent, dendritic feed-through networks will tend to be augmented or replaced by palmar rays or fan communication."

The following arguments are advanced in support of this proposition.

(a) A belief in personal unique competence by a superordinate will tend to discourage the canvassing of opinions of subordinates on the best action to be taken in a stressful situation, unless the superordinate has well developed skill in cultivating a preferred style of leadership which is designed to foster co-operation and initiative among subordinate ranks. In the absence of such a sophisticated approach to communicative "style" in leadership, the tendency will be for the superordinate to direct the action to be taken, and not to allow his assumed expertise to be diluted by the unpredictable initiative of subordinates. The employment of feed-through modes of communication presupposes that the superordinate has exact and detailed knowledge of conditions faced at the operating level. Where this is not present the process approaches "back-seat driving" with possibilities of serious error enhanced by a refusal to admit local initiative.

An admirable historical example is recounted in the Ardennes offensive of 1944. Shulman (1968:288) quotes Rundstedt as follows:

> I strongly object to the fact that this stupid operation in the Ardennes is sometimes called the 'Rundstedt offensive' . . . . That is a complete misnomer. I had nothing to do with it. It came to me as an order complete to the last detail.

Rundstedt was at the time Commander-in-Chief West, yet he was unable to change orders received in any detail. The admission must still be made that history abounds with instances when clear and definite orders from superordinates to the lowest levels of the hierarchy have resulted in notable successes.

Proposition 5

"Organizations which operate sub-systems whose work flows are interdependent will tend to employ reticulated systems of communication more frequently than will organizations which are not so linked."

Although mutually dependent sub-systems can be co-ordinated through the dendrite, this effort might place an intolerable burden of detail on the superordinate at the apex of the dendrite, and would require a detailed knowledge of circumstances at two or more sub-system levels. The general principle that administrators are loathe to do that with great effort which might be equally achieved by less, would suggest that the superordinate would indicate a general intention and then encourage subordinates to arrange between themselves the details of co-operation of which they possess a unique acquaintance concerning how operations in one sub-system will be affected by operations in another. There may occur a stage in organizational growth when unified direction fails owing to the complexity of problems to be solved in an expanding structure. The command function must then be decentralized to admit of subordinate responsibility and initiative in the co-ordination of interlocking functions.

Proposition 6

"Where in an organization, the contours of hierarchical status and personal expertise do not coincide in a superordinate figure, reticulated communication will tend to develop on strata below this figure which will tend to by-pass or to isolate him."

If, other conditions being equal, a superordinate is known to be incompetent or indecisive, his proper subordinates will tend to seek decisions from superordinates on a higher level than their own, if necessary with the intent of having the message passed on to the immediate head of the incompetent, so that necessary intelligence will be passed both upward and downward, much as a blocked artery in the human body will cause the expansion of by-pass routes which are open but not normally used as major pathways. The assumption made here is that such things as must be done will be done, if necessary through unorthodox channels.

Proposition 7

"Where in an organization the chief executive, whether an individual or a committee, is regarded by subordinates as being without that sympathy and expertise regarded by the subordinates as necessary to their effective functioning, horizontal and reticulated networks of communication will be developed below the stratum of the chief executive, to circumvent this perceived deficiency."

The following arguments are advanced in support of this proposition:

(a) Since an ineffective or unsympathetic executive may rarely be expected to concede that he is ineffective or unsympathetic, subordinates, recognizing that they will be judged by both their subordinates and by their hierarchical chiefs as responsible for any observed defects in performance, have two obvious options open to them. The first is to carry out orders with "wooden" precision, while insisting that such orders be preserved in writing. This process will be guided by a desire to fix any blame on the shoulders of the superiors, in the hope that the consequences will be obvious to other agencies which may remove or modify the executive power of direction. Secondly, and if the first alternative is either not applicable to the circumstances, or may be tardy in operation, the subordinates will tend to organize horizontally with each other, and by reticulation with their subordinates, to modify their orders by mutual agreement, so that those actions they perceive as necessary are taken. At the same time, there will be a tendency to appear to comply with orders, combined with defensive mechanisms by which the superiors are deprived of organizational intelligence, other than that which they specifically demand, while even this will be supplied in a form which camouflages the real situation.

This form of sabotage will be difficult to detect, in that the evidence will rarely be committed to documents which are available for inspection. The problem is to judge of how much is said of that which might be said.

Proposition 8

"Where in an organization, the organization is stable, but the rate of personnel turnover is high, communication will tend to be in the form of general policy directives issued in the feed-on mode of the dendrite, or by contracted dendrites, rather than by palmar communication to individuals."

The following arguments are advanced in support of this proposition:

If rapid turnover in an organization occurs, either by reason of poor morale or other cause of casualties, the superordinates will tend to fit new personnel into positions rather than create positions for individuals. The parts of the "machine" will be regarded as machine-made and interchangable. Communications will then be addressed to role-incumbents by impersonal means. This process perhaps is most obvious in the military in periods of active operations. Officers in such circumstances do not seek to find where a man may best employ his talents; he is fitted in as "number two on the gun" whose duties are prescribed by the drill-book (policy handbook).

Proposition 9

"In an organization, the relative proportions of dendritic communication, both upward and downward, to the amount of communication which is reticulated, palmar, and horizontal is a measure of the degree of bureaucracy of the organization; and the difference in such proportion between various strata in an organization indicates the stratified location of such a degree of bureaucratization."

The following arguments are advanced in support of this proposition:

The concept of bureaucracy is vague in the extreme, and no absolute measures appear to be generally agreed. Yet if bureaucracy is held to reside in a chain of command, in the absence of dual control of subordinates by superordinates, in communications being isomorphic with the Table of Organization, the conclusion that dendritic communication networks are consonant with these elements of bureaucracy appears plausible, and if the proposition is supported the proportion of dendritic to other communication would be one absolute indicator of a degree of bureaucracy. The difficulty is to supply "proof" in terms other than assertion. Such proof might be held to be best manifested by comparison of this measure with another such absolute indicator. Such other indicators, like the one advanced here, only rest on simple assertion. The semantic problem is that bureaucracy, like other concepts, must be defined in some terms. To demonstrate that the attributes are present in some quantity, merely confirms the appropriateness of the original definition.

Proposition 10

"Other conditions being equal, the volume of communication, together with the communication networks employed over a prolonged period, indicate the administrative communication 'mode' of a superordinate figure."

The following arguments are advanced in support of this proposition:

That a subordinate has a communication "mode" appears unlikely, in that mode of network selection is more likely to be a function of communication origination than response. Inasmuch as superordinate figures appear more likely to originate communication requiring response from subordinates than the reverse, such "mode" might reasonably be manifested by superordinate figures rather than by subordinates. Again, such mode is more likely to be manifested over a long period of time than over a short, because of the obvious oonsequences of sampling error. A superordinate who declares a problem to subordinates and invites their solutions; one who does not declare the problem but imposes a series of actions; one who blames subordinates for problems and demands solutions, all display communication styles as a facet of what might be termed "leadership." Again, a superordinate who accepts feed-back reports from subordinates through the dendrite differs from one who checks lower strata performance personally or through staff officers. The difference lies between passive reception and active search; between feed-back within and without the chain of command.

Concluding Remarks on the Propositions

This section was not designed to be exhaustive of all inferences which might be made from a theory of communication network classification in formal organizations. Such as have been advanced appear to the author to be reasonable hypotheses, and capable of support or rejection by empirical investigation by known methods.

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